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Improved Balanced Slide Valve.

Aside from one defect, the slide valve is one of the simplest and most efficient devices ever invented for its office. The great amount of power absorbed in working it, the strength and weight consequently required in all connected with it, the constant wear and liability to break down, the delay and expense of frequent repairs, the unmanageability of large engines on account of the difficulty of reversing or working the valves by hand, are sufficiently well known. Many ingenious contrivances have been invented to relieve the slide valve of its pressure, and we illustrate a simple arrangement by which the inventor claims it is perfectly balanced. The details are as follows:—

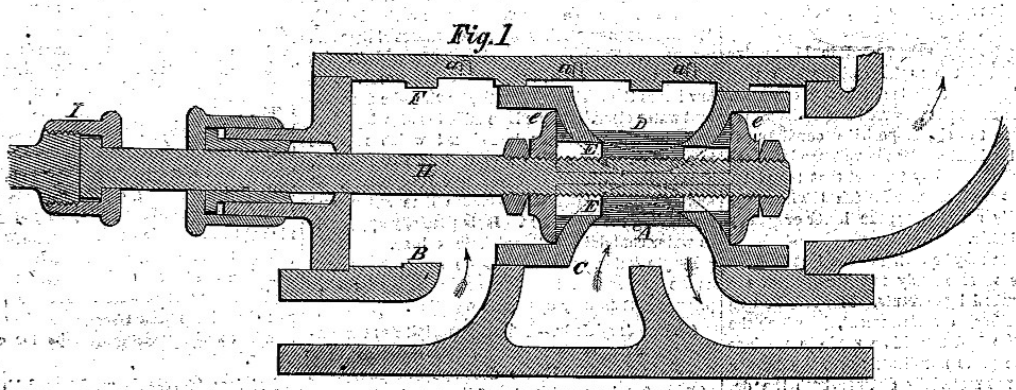


Fig. 1

RICHARD'S BALANCED SLIDE VALVE.

A is a slide valve, working upon the seat, B, which is of the usual form, except that the middle port, C, is connected with the boiler, thus admitting the steam under the valve, the exhaust being discharged into the chest, as indicated by the arrows. D is another valve, similar to A, working against the inner side of the cover, which has three shallow ports cut in it, say ¼ of an inch deep, equal and corresponding to the three ports of the valve seat, A, the opposite ports of the two seats being connected by means of small holes, *a a a*, drilled through the side of the chest. On the valve rod, H, is a nut, E, having two opposite sides beveled so as to form a wedge. This wedge nut is between the valves, bearing against the back of each and pressing them to their seats. Upon turning the valve rod, the driving collars, *e e*, being held by their jam nuts, turn with it, and remain still in contact with the shoulders of the valves, while the wedge-nut, E, working easily upon the valve rod, does not turn, but advances or recedes between them. The valves can thus at any time be exactly adjusted to their seats by slacking the coupling nut, I, and turning the valve rod. When once adjusted, the wear will be found very slight and the need of readjustment infrequent.

The faces of the two valve seats, B and F, being equal, and the pressure from their corresponding ports being equal by means of the apertures, *a a a*, connecting them, and the faces of the valves, A and D, being also equal, the pressure under the valves will always be the same, and, communicating with each other by means of the wedge nut, E, between them, their pressures will exactly balance each other. As the chest receives only the exhaust, the friction and wear of the valve rod at the stuffing box is very slight.

It is believed that this valve will readily commend the engine more manageable and consequently safer, and is applicable to either high or low pressure engines, or where single valves at each end of the cylinder are used. For a balanced cut-off valve it is equally advantageous.

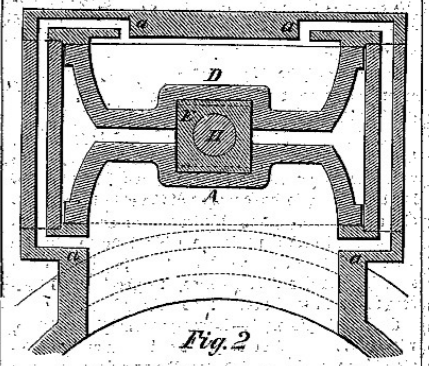
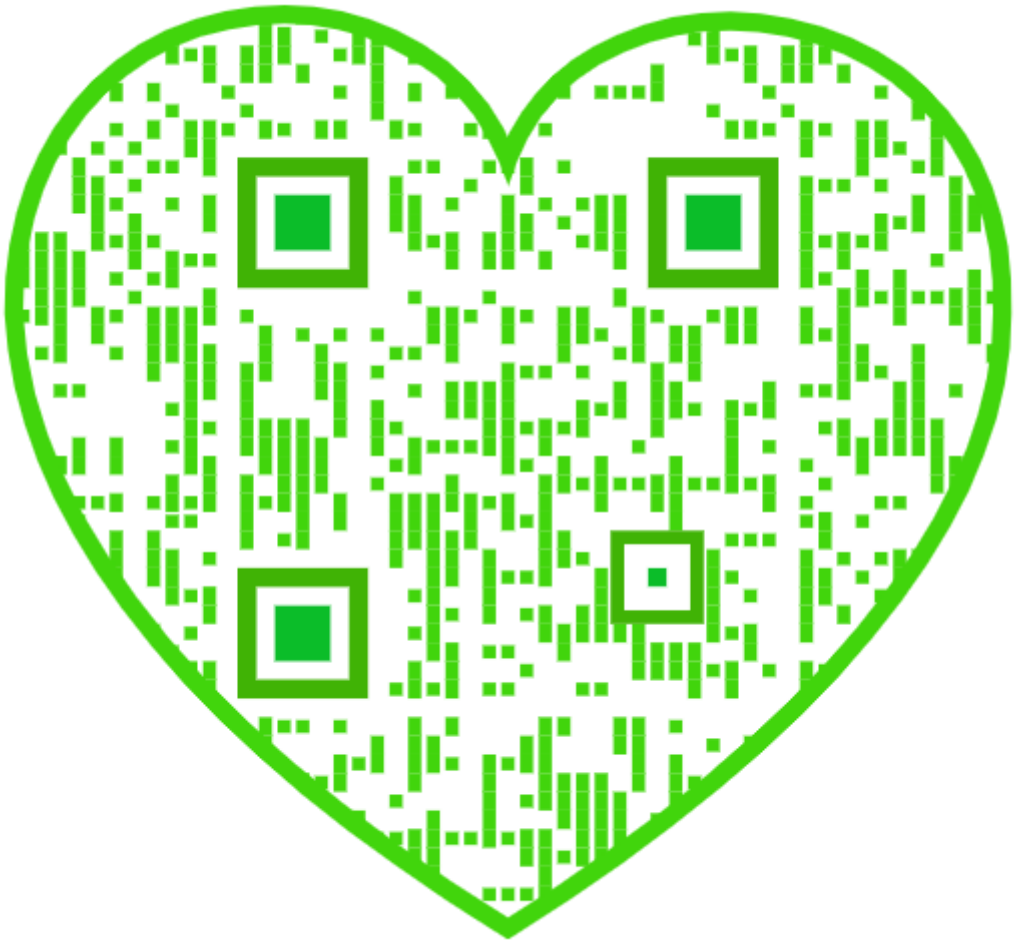


Fig. 2

A patent was allowed on this valve Oct. 25th, 1865. Rights to use it for any portion of territory, or the whole right, are for sale. Address the inventor and patentee, Frank H. Richards, Troy, N. Y.

The "Hercules" Target.

During the month of June last, this target was subjected to the fire of three Armstrong 300-pounders, or 12-tun guns, fired with 300 lbs. rifled projectiles and charges of 45 lbs., 55 lbs. and 60 lbs. of powder, when it proved quite impenetrable by any single shot. It has again been tested at Shoeburyness to show its power of resistance to the most powerful artillery that can be brought against it. At the recent trial, which took place on Dec. 7, the 600-pounder Armstrong, or 22-tun gun, was brought against it at 700 yards' range, with rifled projectiles of from about 575 lbs. to 585 lbs. weight, and with charges of 100 lbs. of powder—charges altogether unprecedented in any rifled gun. Except where two shots have struck rather near together, the target is still victorious. The lower half of the *Hercules* target is faced with 8-inch iron, the upper with 9 inch iron; behind both is 12 inches of horizontal timber divided by four horizontal plates, then a skin consisting of 2 ½-inch plates, the whole being secured to the ribs, which are 10 inches deep, filled in between with vertical timber. Behind the ribs are two linings of horizontal timber 18 inches deep, not bolted, but confined by 7-inch iron ribs inside all. There is another three-quarter iron skin within the innermost wood backing, making up the total thickness of the target to more than 4 feet. With this armor it is proposed to protect the water-line of a ship, to be called the *Hercules*, leaving the remainder of her sides as vulnerable as those of our ordinary iron-clads, and the plan, if practicable, is undoubtedly of the greatest merit and importance. In the recent trial, the target sustained altogether seven rounds from the 600-pounder. The first of these was a steel rifled shot of 575 lbs. weight, fired with a charge of 100 lbs. This shot left the gun with a velocity of 1,420 feet per second, and struck the target at 700 yards' range, with a velocity of 1,280 feet, burying itself completely, breaking the rib of the ship immediately in the wake of the blow, and snapping off a considerable number of rivet heads from the innermost skin. The second round was a repetition of the first, and, except that the shot deflected a little upward, owing to its having struck where the target received the extra support due to the deck of the vessel, the result was nearly the same. After this a chilled iron Palliser shot of 580 lbs. weight, fired with the same charge from the same gun, struck the target with 330 feet velocity, and close to the hole made by the preceding round. The effect produced by this shot was very great. The inner skin and ribs of the target were torn asunder and a great quantity of the pieces of the shot were forced through, as langrage, into the ship. A third Palliser shot of chilled iron struck the same 8-inch plate fairly, penetrated it completely, and lodged in the backing, cracking an inner rib. A blind steel shell followed, and struck the 9-inch plate, breaking it up to a serious extent, but effecting very little penetration. Except with the Palliser shot, the present form of which has always proved unfavorable for accuracy, the gun shot remarkably well both on this occasion and on the Tuesday previous, when it was tested with the same enormous charges of 100 lbs. for accuracy and initial and terminal velocities. The very high velocity given to the 580 lbs. projectiles, varying from 1,420 feet to



1,460 feet per second, according to their greater or less windage, shows also that the gun and powder both did their full duty.—*Mechanics' Magazine.*

PROFESSOR CHANDLER ON BOILER INCRUSTATIONS.

[Concluded from page 17.]

THE CORROSION OF THE BOILER PLATES.

The only substances contained in the water, which can be supposed to act upon the iron, are the alkaline salts, chlorides of potassium and sodium, sulphates of potassa and soda, and chloride of magnesium. That these substances do affect iron is shown by introducing slips of iron and copper connected with a galvanometer into their solutions. A galvanic current is produced, which is a certain indication of chemical action; although the short duration of such an experiment precludes the possibility of any considerable corrosion of the iron.

The impression which prevails among some of the employes of the road, that the corrosion is due to some acid, is not confirmed by the analyses of the water. No free acid, except carbonic, exists in any one of them; and the presence of the carbonates of lime and magnesia renders the existence of any other free acid impossible.

The copper and brass tubes, used in locomotive boilers, on account of the rapidity with which they "make steam," must greatly facilitate the corrosion of the iron. The copper is rendered electro-negative, while the iron in the electro-positive condition is corroded. That the incrustations have some influence on the corrosion is proved by the fact that the plates which suffer most are those upon which the incrustations most rapidly accumulate; the lower or "belly plates" of the boiler.

This coincidence may be owing to the fact that the deposits subside most readily in those parts of the boiler least disturbed by currents. It would be well to ascertain whether an arrangement, by which the water entering the boiler could be made to produce currents in those parts not directly over the flues or fire box, would not materially diminish both the deposits and corrosion.

As a somewhat anomalous fact, it may be mentioned here, that even chemically pure (distilled) water is not adapted for "feeding" boilers. Some of the condensers used in connection with marine boilers, for condensing the waste steam, are found to furnish water which produces effects quite similar to those noticed in the locomotive boilers. It is even stated that the addition to this water of a small quantity of water containing chloride of sodium and sulphate of lime (sea water) suffices to prevent the corrosion.

The corrosion of the locomotive boilers is not evenly distributed over the surface of the plates, but is confined to pits and grooves which are most abundant along joints, and in fact wherever the surface of the metal may have been bruised. The surface of the boiler plates is harder, and less readily attacked, than the interior, which it protects, as the skin of an apple protects its interior from decay. In trimming down the rough edges, where the plates lap and where braces are riveted to the plates, the boiler makers are liable to cut through this hard surface with their chisels, and at these points the corrosion is most rapid.

After a careful consideration of all the facts of the case, I am satisfied the corrosion of the plates is due to the saline substances already mentioned aided by the electro-positive condition of the iron (induced by contact with the copper or brass tubes), by the presence of bulky incrustations, and by the high temperature of the water.

MEANS FOR PREVENTING BOILER INCRUSTATIONS AND CORROSION.

Numberless substances and methods have been proposed, from time to time, for preventing the bad effects of impure water in boilers. Although it is beyond the plan of this report to discuss, or even to mention them all, it is important that some general idea of the principles upon which their supposed efficacy is based be given here.

Most of the methods are designed merely to prevent and remove incrustations; the opinion has been already advanced, however, that corrosion is much aggravated by the presence in the boiler of calcareous deposits. Methods which prevent incrustations must therefore diminish corrosion. Some of the methods to be mentioned are applied to the water before it enters the boiler; in other cases, substances are introduced into the boiler itself. In most cases, the salts of lime and magnesia are either precipitated in fine particles as a loose mud, or rendered permanently soluble.

Filtration, which removes suspended impurities, is in this case useless, as the salts to be removed are in solution.

Distillation is particularly recommended, and employed to a considerable extent, for marine boilers using sea water. The anomalous behavior of distilled water has been already mentioned. This method of purification is entirely impracticable for locomotives.

Boiling expels the free carbonic acid, and causes the separation of the carbonates of lime and magnesia, and if conducted at a high temperature, under considerable pressure, results in the almost complete precipitation of the sulphate of lime. This would, however, merely transfer the incrustations from the locomotive boiler to some other vessel, and would, therefore be valueless in this case.

Lime water is employed on a large scale at Woolwich. The lime combines with the free carbonic acid, causing the precipitation of the carbonates of lime and magnesia. The proportion of lime water added varies with the amount of free carbonic acid present. In a few hours the carbonates settle, leaving the supernatant water clear. As the lime added is also deposited as carbonate, nothing is introduced which remains in solution. The sulphate of lime is not affected. This method is readily applied and inexpensive. It merely requires extra tanks for the lime water, and for settling the sediments. It is specially applicable to water containing little sulphate of lime.

Baryta water, which affects the sulphate, as well as the carbonates, has been proposed, but its high price puts it entirely out of the question.

Carbonate of Soda.—This salt precipitates the carbonates of lime and magnesia, by withdrawing the free carbonic acid. It also decomposes the sulphate of lime, forming carbonate of lime, which it deposited, and sulphate of soda, which remains in solution. This is very effective, and not expensive. Added in excess, however, it is said to produce priming and leakage. Carbonate of potash would answer the same purpose, but is more expensive; caustic soda and potash behave in nearly the same manner. Carbonate of ammonia has the same effect on lime salts, but does not precipitate the magnesia. Carbonate of soda is preferable to the other substances of this class on account of its low price.

It may be advisable to employ caustic soda in some cases, on account of its superior efficacy in loosening hard scales.

Chloride of Barium—Decomposes sulphate of lime, forming sulphate of baryta, which is deposited. This would be too expensive in this country, besides being objectionable on account of the chloride of calcium left in the water. Hydrochloric acid is sometimes added with the chloride of barium to dissolve the carbonates of lime and magnesia, and form the soluble chlorides of calcium and magnesium. In excess this acid would attack the boiler plates.

Carbonate of Baryta—Decomposes sulphate of lime, with the formation of sulphate of baryta and carbonate of lime, both of which separate as a deposit. The carbonates of lime and magnesia contained in the water are not affected. This method may be applied to water which has been freed from its carbonates by lime water, the carbonate of baryta being introduced into the boiler. Carbonate of lead, which behaves in a similar manner, has been suggested for the same purpose; larger quantities would, however, be required, and is much more expensive.

Chloride of Ammonium.—This salt is very effective in decomposing the lime and magnesia salts, even after they have been deposited, forming soluble chlorides of calcium and magnesium, carbonate of ammonia, which is rapidly expelled with the steam, and sulphate of ammonia, which remains in solution. The quantity added should, at least, equal the quantity of carbonates of lime and magnesia and sulphate of lime present in solution.

When it is desired to loosen a considerable deposit, hydrochloric acid may be cautiously added at the same time. The acetate and nitrate of ammonia resemble the chloride in their action, but are neither as powerful, nor as low priced.

Chloride of Tin—Has been used by a French engineer. He employed about eight pounds per week for an engine working twelve hours daily. He recommends for large boilers one pound of the salt for every sixteen cubic feet of water. The chloride of tin is decomposed, forming an insoluble basic salt which is deposited, and a soluble acid salt which dissolves the lime and magnesia sediments.

It is not equal to chloride of ammonium in effectiveness, and is far too expensive for general use.

Silicate of Soda, Phosphate of Soda, Arseniate of Soda, etc.—Have been recommended for purifying water for special purposes, as for tanning and dyeing. They are not at all applicable in the present case.

Hyposulphite of Soda—Has been proposed on account of its property of increasing the solubility of sulphate of lime. It would be too expensive in practice.

Catechu, Nutgalls, Oak Bark, Shavings and Sawdust, Tan Bark, Tormentilla Root, Mahogany, Logwood, etc.—These substances all contain more or less tannic acid, associated with soluble extractive and coloring matters. When they are introduced into the boiler, the soluble constituents are dissolved by the water, and basic tannate of lime is formed, which separates as a loose deposit, which does not adhere to the sides of the boiler. It is preferable to use the aqueous extract, as sawdust, chips, etc., are liable to find their way into the cocks and tubes, although they act mechanically, receiving incrustations, which would otherwise fasten themselves on the sides of the boiler. In selecting one of these substances, one would endeavor to secure the largest quantity of tannic acid and soluble extractive matter for the lowest price. Some of these substances are said to be very effective, one-half pound of catechu being sufficient for 100 cubic feet of water. From 4 to 6 pounds of oak chips have been recommended per horse power, or a half bushel mahogany chips for every 10 horse-power.

Potatoes, Starch, Bran, Linseed Meal, Gum, Dextrin, Irish Moss, Slippery Elm, Marshmallow Root, Glue, etc.—These substances form, sooner or later, a slimy liquid in the boiler, which prevents more or less completely the settling and hardening of the deposits. Some of them may even hold the lime and magnesia in solution. Potatoes have been used for many years, wherever steam engines are employed; half a peck or a peck are thrown into the boiler weekly. Linseed meal, mixed with chopped straw was employed on a German railway, a peck at a time being introduced into each boiler. Some writers object to these organic substances, on the ground that they are liable to cause frothing.

Sugar, Molasses, Corn or Potato Syrup.—Both cane and grape sugar form soluble compounds with lime salts, and consequently prevent their separation as incrustations. One engineer found that ten pounds of brown sugar protected his boiler for two months; another, that six pounds of corn starch syrup had a similar effect. Another used molasses with success, introducing a gallon at a time.

Fatty Substances.—One writer used whale oil to prevent incrustations, two or three gallons at a time. Others smear the inside of the boiler with various mixtures of a fatty character. Stearine, mixed with wood ashes, charcoal and tar, has been recommended, or tallow, with soap and charcoal diluted with oil or tar, or tallow and graphite. This plan could not well be applied to a locomotive boiler with its numerous tubes, even though it should prove effective in cylinder boilers.

Tar, Pitch and Rosin—Have been applied in a similar manner.

Mechanical Agents—Of various kinds have been employed with doubtful success to prevent the hardening of deposits on the sides of the boilers. By offering solid particles suspended in the water, they serve as nuclei for the accumulation of the calcareous sediments. Clay was formerly used. It was carefully sifted and washed, and introduced, five or six pounds at a time, into the boiler. It was found however, that hard silicious particles were sure to find their way to the cylinder, scratching its surface.

Sawdust, Chips, Shavings, Straw, Powdered Glass,

Scraps of Sheet Iron and Wire Gauze—Have also been used and generally abandoned.

A Wire Gauze Lining—Has been proposed, and I believe, patented, as a protection against incrustations. Such an arrangement may perhaps be useful in a cylinder boiler, but could not well be applied to the tubular boilers of locomotives.

Blowing Off.—The frequent blowing off of small quantities of water, say a few gallons at a time, is undoubtedly one of the most effective and simple methods for removing sediments and preventing their hardening on the sides of the boiler.

The water entering the boiler should be directed in such a way as to sweep the loose particles toward the blow-off cocks, that when these are open they may be carried out with the water. This blowing off should take place at least two or three times daily, perhaps much oftener.

Great care should be taken to avoid emptying the boiler while there is still fire enough to bake the muddy deposits.

Washing out frequently is very efficacious.

Metallic zinc, attached to the plates of the boiler so as to secure actual contact, is probably one of the best preventives of corrosion. As already mentioned, the iron protects the copper and brass tubes by rendering them electro-negative, being itself much more rapidly corroded in consequence. Zinc bears the same relation to iron that iron does to copper, and may be made therefore to bear the corrosion. Rolled zinc is preferable to slabs, as the latter are very crystalline, and are consequently very unevenly corroded, soon becoming brittle and working loose.

Electro-magnetic inductors have been proposed. One has been patented by Parry, and another, I believe, by A. F. Porter. It is claimed that these inventions prevent corrosion and incrustations, though I have seen no evidence either in their favor or against them, nor do I know their principle.

G. F. Bonsfield's patent for protecting iron from wear by galvanic action, dated Feb. 19, 1862, consists in insulating electro-negative bodies, copper etc., by washers or packing of India-rubber, or other non-conducting substances. I know nothing of its merits.

Incrustation powders, bearing generally the names of their proprietors, are extensively advertised and sold; they are either worthless or are sold at such extravagant prices as to make their use extremly ill-advised. I have examined several of them. Those which are at all valuable consist of one or more of the subtances already mentioned, and the only novel result of their use is the payment of many times the commercial value for a fair article.

One which is put up in tin boxes, containing about one pound, at $2 50 each, contains

Carbonate of lime	95·35
Carbonate of magnesia	0·67
Oxide of iron	4·15
	100·17

It differs little from some of the incrustations in composition, and is of no value whatever.

Another contains

Logwood	75·00
Chloride of ammonia	15·00
Chloride of barium	10·00
	100·000

This is a very good article, but at the price for which it is sold it cannot be used in quantities sufficient to produce much effect. In fact, chloride of barium is too expensive to be used in this country at all.

In conclusion, I would advise—

1. The use of the purest waters that can be obtained, rain water wherever possible.
2. Frequent use of the blow-off cock.
3. That the boilers never be emptied while there is fire enough to harden the deposit.
4. Frequent washing out.
5. Experiments on the efficacy of zinc, lime water, carbonate of soda, carbonate of baryta, chloride of ammonium, some substance containing tannic acid, linseed meal, and the electro-magnetic inductor.

THE new five-cent fractional currency will probably be issued next week. About $80,000 worth of defaced and mutilated currency is daily destroyed at Washington by burning, and $50,000 worth is printed.

NOTES ON NEW DISCOVERIES AND NEW APPLICATIONS OF SCIENCE.

TITANIFEROUS IRON.

On the 24th of November some account was given in this journal of the results of some experiments made by Messrs. D. Hipkins & Sons, of West Bromwich, with some iron, smelted by Mr. Charles Martin's patented process, from the titaniferous iron-sand of New Zealand. Other firms have since been experimenting with specimens of this iron, with results quite as satisfactory as those previously obtained by the Messrs. Hipkins. To the account of the properties of this almost unprecedentedly fine quality of iron which we gave three weeks ago, we may now add that a "heat" of it can be puddled in sixty minutes, which is just half the time per heat which the process of puddling usually occupies, and that the loss of iron in the process is only one-fourth of the usual proportion of loss. Moreover, this titaniferous iron has the remarkable property of completely resisting the action of hydrochloric acid. The peculiar quality which gave it its great value are doubtless due, in part, to its entire freedom from both sulphur and phosphorus, and not exclusively to the titanium which it contains. Still, it seems to be pretty well ascertained that a small quantity of titanium very greatly improves the quality of both iron and steel, and hence considerable attention is beginning to be directed towards the titaniferous iron ore, or "ilmenite," which exists in such vast quantities in Sweden, Norway, and Russia, and also in Canada and elsewhere, and which, while it can be had in this country much more cheaply than the New Zealand iron-sand, which contains only from 9 to 13 per cent of oxide of titanium, contains not less than 40 per cent of that oxide. As yet, there are many difficulties in the way of smelting, on a great scale, ores of iron containing so much titanium as the European titaniferous ores contain, but these difficulties will doubtless yield to sufficiently persevering efforts to overcome them. It is not proposed to endeavor to smelt these ores by themselves; all that is contemplated is the admixture of them, in small proportions, with our ordinary English ores. The conditions, however, under which such a mixture can be satisfactorily smelted, have yet, for the most part, to be ascertained.

THE GASES CONTAINED IN MOLTEN IRON AND STEEL.

All who have witnessed the operation of casting either iron or steel must have remarked the disengagement of combustible gas which takes place at the moment of pouring the metal into the mold. The gas has usually been supposed to be due to the decomposition by the molten metal of the moisture contained in the sand of the mold, but this explanation of the phenomenon has just been disproved by M. Cailletet, a most interesting note by whom on this subject was presented to the Academy of Sciences on the 13th of last month, by M. Henri Samte-Claire Deville, M Cailletet's experiments leave no doubt that combustible gases are evolved by molten iron, during cooling, when the iron has not come in contact with either sand or any other body containing moisture, and that these gases always consist mainly of hydrogen and carbonic acid. M. Cailletet at first endeavoured to collect the gases by puring molten iron into a red-hot cast-iron vessel, having a mouth of very small aperture, to which, as quickly as possible, after pouring the iron in through it, he attached a tube connected with a kind of pneumatic trough. He found, however, that he could collect very little gas by this method, since most of the gas escaped before the mouth of the vessel could be closed by the fitting to it of the tube, and his next plan, therefore, was to use a conical vessel, having no bottom, but having an apparatus for the collection of gases attached to its upper part, and to plunge this vessel,—having first rendered it red-hot, in order to free it from all trace of moisture,—into the molten metal, the gases contained in which he wished to examine. The difference between the temperature of this red-hot vessel and that of iron in a state of fusion, of course, caused the liquid metal which entered the interior of the vessel to instantly cool, and in so doing it always evolved gases, which always consisted principally—if not entirely,—of carbonic oxide and hydrogen. There was always some nitrogen mixed with these gases, as collected, but M. Cailletet thinks that this may possibly have been wholly due—it must entirely have been due in part—to the air with which the apparatus was of course filled at the commencement of each experiment. He gives the composition of the gaseous mixture contained in his apparatus after two experiments, in one of which an English "grey" cast iron, smelted with coke, was used, and in the other a very good quality of French iron, smelted with charcoal. In the one instance the gases consisted of 33·7 per cent hydrogen, 57·9 per cent carbonic oxide, and 8·40 per cent nitrogen, and in the other of 38·60 per cent hydrogen, 49·20 per cent carbonic oxide, and 12·20 per cent nitrogen. M. Cailletet could not succeed in collecting by the same method, the gases evolved, during cooling, by molten steel, the temperature of molten steel being so high as to instantly liquefy the vessels he tried; but he collected the gases from steel by another method, and found that they also consist chiefly of carbonic oxide and hydrogen. He is still pursuing his experiments, which may possibly lead to results of practical moment.

A CARBON COMPOUND SENSITIVE TO LIGHT.

Dr. F. Gottschalk has found that graphitic acid,—of which more below,—is sensitive to light, the minute yellow crystalline scales of which the acid consists blackening very quickly when exposed either to direct sunlight or to diffused daylight, or to any powerfully actinic artificial light. Photographers are hoping that this discovery may lead to that of some simple and satisfactory process of carbon-printing, and several of them are studying graphitic acid very closely with a view to this end. One of the chief difficulties in their way arises from the exceeding slight solubility of this singular body, which dissolves in water and alcohol only in very minute quantity, and not at all in any other menstrum that has yet been tried. Small, however, as is the proportion of it which will dissolve in water, paper soaked in its aqueous solution becomes reddish brown on exposure to light, any parts of the paper which may be protected from the light remaining quite white.

A NEW HYDRAULIC CEMENT.

At the sitting of the Academy of Sciences on the 4th inst., M. Henri Sainte-Claire Deville announced that a very valuable hydraulic cement may be obtained by heating dolomite,—the abundant native double carbonate of magnesium and calcium, commonly known as "magnesian limestone,"—to between 300 and 400 deg. Centrigade, and then making it into a paste with water. The heat to which the dolomite is subjected should be above 300 deg., but should not exceed 400 deg.—*Mechanics' Mag.*

Sale of Dead Letters at Auction.

The great sale of articles, accumulated through the year in the Dead-Letter Office, was commenced in Washington on the 30th ult., and has been continued with the liveliest kind of bidding ever since. The *Star* says that over half the immense catalogue is of jewelry, largely of the "dollar" sort, but with sprinkling enough of the genuine to induce a lively competition. Upward of three hundred articles in the collection are packages of patent medicines, in the shape of pills, powders, unguents, oils, old school and new school, allopathic, homœopathic, Thompsonian, eclectic, and all sorts, for the relief of every malady known to man or women. There are over one hundred and fifty gold (supposed to be) watches on the catalogue, and no end of silver watches. Also an indescribable medley of all the varieties of wares known to civilization. Among the articles thus passed through Uncle Sam's mails, finding their way to the Dead-letter Office, are sets of shoemakers' tools, packages of type, ladies' wigs, bundles of clothing, duplicate parts of sewing machines, packages of felt hats, iron cog-wheels (small), lots of lampwicks, dress elevators, false bosoms (ladies'), shoulder straps, pieces of a piano, lamp burners, hundreds of military books, etc.

The proceeds from the sale will be deposited, subject to the order of the owners, should any of them turn up.

The largest *steam* cylinder ever cast in this country, was poured at the Etna Iron Works last week. It was 112 inches diameter, by 12 feet stroke of piston

USEFUL RECIPES.

To Prepare a Varnish for Coating Metals.—Digest one part of bruised copal in two parts of absolute alcohol; but as this varnish dries too quickly it is preferable to take one part of copal, one part of oil of rosemary, and two or three parts of absolute alcohol. This gives a clear varnish as limpid as water. It should be applied hot, and when dry it will be found hard and durable.

To Varnish Articles of Iron and Steel.—Dissolve 10 parts of clear grains of mastic, 5 parts of camphor, 15 parts of sandarach, and 5 of elemi, in a sufficient quantity of alcohol, and apply this varnish without heat. The articles will not only be preserved from rust, but the varnish will retain its transparency and the metallic brilliancy of the articles will not be obscured.

Bronze Varnish for Statuary.—Cut best hard soap 50 parts, into fine shavings, dissolve in boiling water 2 parts, to which add the solution of blue vitriol 15 parts, in pure water 60 parts. Wash the copper soap with water, dry it at a very slow heat, and dissolve it in spirits of turpentine.

Furniture Polish.—New wood is often French-polished. Or, the following may be tried:—

Melt three or four pieces of sandarach, each the size of a walnut, add one pint of boiled oil, and boil together for one hour. While cooling add one drachm of venice turpentine, and if too thick a little oil of turpentine also. Apply this all over the furniture, and after some hours rub it off; rub the furniture daily, without applying fresh varnish, except about once in two months. Water does not injure this polish, and any stain or scratch may be again covered, which cannot be done with French polish.

Gold Lacker.—Put into a clean four-gallon tin, one pound of ground turmeric, one and a-half ounces of gamboge, three and a-half pounds of powdered gum sandarach, three-quarters of a pound of shellac, and two gallons of spirits of wine. When shaken, dissolved, and strained, add one pint of turpentine varnish, well mixed.

THE FOOT LATHE.

Number 5.

CHUCKING.

Chucking work in the lathe is one of the most interesting branches, for here there are no centers in the way to plague the workman, and the tool has a fair sweep at all parts. Every one who uses a lathe should get a scroll chuck; that is, a chuck where the jaws move up together toward the center, so that any round piece will be held perfectly true. This is a great convenience, for whether we have a ring to bore out, or a wheel to turn off, it is equally handy, and is far better than the independent jaw chuck, which has to be set up by measurement, and repeated trials before it is right. To those who cannot afford to purchase a scroll chuck a wooden one can be made to answer every purpose. Wooden chucks should be made of some hard, fine-grained wood, such as maple or mahogany, so that they will hold well whatever is driven into them.

If we have a small cylinder head to turn, for instance, the back head which has no hole in it to put a mandrel through, as the front one has, the wooden chuck will come in play. To make one, the turner takes a square block of the proper thickness, say one inch, and saws the corners off so that it is eight-sided. It is then ready to screw on the face plate of the lathe. This is quickly done by having small screw holes in the plate for this purpose, as shown in the engraving at the head of this series.

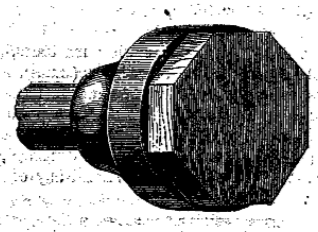


Fig. 20.

The block is then all ready to work on, and the face must be turned off true, and a recess cut out in it to receive the head. This is the head, Fig. 21.

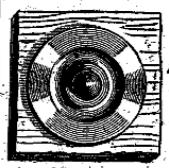


Fig. 21.

On the back side there is a projection to fit the cylinder of the engine. This must be turned first, and the flange faced off true; after that the head must be pryed out (by making a little recess in the chuck alongside of it), reversed and put in the chuck again, the finished side in, so as to polish it on the outside. It must be driven up tight against the face of the chuck, otherwise the flange will be thicker on one side than the other. In finishing, it will be found better to commence near the center and work out toward the largest diameter, for it is necessary to get under the scale, or sand left on in casting, first, before the work can be turned true, and this is easiest done by beginning at the middle where the speed is low. The scale is fused sand melted on the metal in the act of casting. The best tool to do this with is the diamond-point, for it can be employed universally on straight or hollow surfaces, is easily ground, and always works well. After it comes the scraper previously shown. If these chatter, a piece of leather must be put between them and the rest. It is also well to put a stout iron rod or piece of hard wood between the back center of the lathe and the face of the plate; this keeps everything steady, as shown below, so that a beautiful luster will be given by the tool alone.

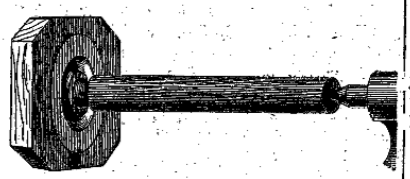


Fig. 22.

After the plate or head is firmly scraped, it must be polished with flour emery, and oil. The emery first used must be No. 1, which is about like indian meal; if the work is brass, however, this will not be needed. This must be plentifully supplied with oil, so that it is like cream, and the workman, taking a soft pine stick, with the end pounded into a brush, so that it will hold emery, holds it hard up against the face of the head. If it has been properly scraped a few revolutions will produce a fine-grained finish, but if it is badly done, the corners will be full of scratches and chatters. It takes time and experience to make a good finisher, and patience, also, for men who are good turners, and can make excellent fits, are sometimes botches at polishing.

After emery of the finest possible description has been used, a little rouge powder should be put on a piece of buckskin and applied to the work. This will make a polish equal to gold on brass, and like silver on iron. Instead of these methods many persons burnish their work. The burnisher is sometimes made of steel of bloodstone and of agate. Steel is the material generally employed. It is polished as bright as can be on a buff wheel, and must be preserved so, otherwise it is useless to attempt doing anything with it. Pumice stone is very good for polishing with, or rather for finishing the surface before polishing. Other substances will be mentioned hereafter. Steel and iron are best polished with a sharp tool and water. To turn steel with a handsome surface the tool must be sharpened on an oil stone and the speed high, then spit on the work and take light cuts, and you will have a nice job. To make a very brilliant polish on steel it is necessary to use emery and oil, plenty of oil and not much emery, but this makes such a nasty mess on the lathe that few good turners will do it. A file should not be used in the lathe if possible; filing a job makes it uneven, and spoils the look of it. It is difficult to avoid scratches, and the expert can generally tell the difference between work that has been turned true and that which has been filed, and in nearly all cases it is quicker to turn the work to fit or to finish at once.

In polishing round work, such as rods or shafts, it is much cleaner and more expeditious to make a pair of clamps like this, and put the emery and oil on leather pads between them. The clamps consist of two *straight* pieces of soft or hard wood lined with leather, though some use sheet lead.

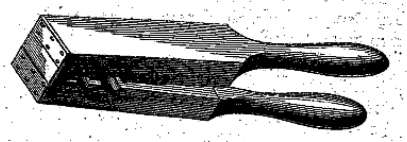


Fig. 23.

The leather catches the polishing material and holds it, and, at the same time, keeps it continually applied to the shaft. The clamps are slipped over the same, and the ends held in the hand. This utensil also gives a fine finish to the work, making it smooth and even. It must be carried regularly along from end to end, sometimes fast and sometimes slow, so as to cross the lines, or avoid making a twist in the polish like a screw thread, which would otherwise be given. A very beautiful and brilliant luster can be given to a shaft of iron or steel, after it is nicely finished, by holding a sheet of *sand paper* covered with chalk, not emery, of a fine quality on it. The glaze that this gives makes the work glisten like silver, but it also takes off all the grease, so that the shaft is very sensitive to moisture, and is quickly rusted.

This discussion about polishing has led us away from the consideration of chucking which we shall enlarge a little more upon.

The chuck is a very necessary and even indispensable auxiliary when chasing. Threads cannot be caught in the jaws of a scroll chuck because, if set tight enough to hold the work, the threads are jammed so that they will not run in the part they were fitted to. If a piece, having a thread cut on it like Fig. 24, is to be turned outside, it is very easy to chase the cap first and then the cup it fits, so that the cap can be screwed into it and turned off where it belongs; it will then be true, and is easy to mill on the edge.

Fig. 24.

It must always be borne in mind that the chaser must be sharp. If it is not, drunken threads will be the rule, not the exception.

[To be continued.]

Snow-Storm in the House.

A writer in *Once-a-Week* gives a description of a Russian ball, at Moscow, during which the ball-room was enlivened by the phenomenon of a snow-storm produced by the sudden lowering of the temperature of the room. The room being uncomfortably warm, a gentleman lowered a window from the top, when the cold air rushing in so condensed the vapor near the ceiling that it descended in the form of snow-flakes. The writer says "probably there was never seen so curious a sight on a ball-room floor." "Perhaps so, so far as a ball-room is concerned, but" says the Reno (Pa.) *Times*, "We have seen a stranger snow-storm yet. It was upon an intensely cold day of a terribly cold winter in the northern part of Maine, and upon the weekly 'washing day.' The outer portion of the room was so cold that the steam arising from the washing-tubs and boilers, as it floated toward the window, was rapidly congealed and fell to the floor in the form of snow. This in-door snow-storm (without any windows or doors being open) continued for an hour or more, and was much talked of in the neighborhood."

The Utica (N. Y.) *Herald* says that the ice house of L. R. Lyon, of Lyon's Falls, N. Y., has not been empty for twenty years, nor has a pound of ice been put into it. The building is constructed after the ordinary method; and when it is designed to fill it, a rose jet is placed upon the water pipe, and as the water comes through it, it is chilled and drops into the ice house, where it forms a solid mass of ice.

The practical advantage of the under-ground railway in London, England, is, that the traveler may ride as far for two cents in ten minutes as above ground he can ride for twelve cents in an hour.

POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting at its room at the Cooper Institute, on Thursday evening Dec. 28, 1865, the President, Prof. S. D. Tillman in the chair.

MORE RARE MINERALS ON THIS ISLAND.

Mr. Chipman presented a specimen of molybdenite, which he found at the corner of First avenue and 45th street, in this city. He presented also another mineral, which he said has been analyzed by Professor Chandler, of the School of Mines, of Columbia College, and found to be the much rarer mineral, molybdinic acid.

BAD BOILER PLATES.

Mr. Silleck stated, in the course of a discussion on boiler explosions, that boiler plate is now manufactured in a very defective manner. Piles are built up of all sorts of scrap, to the weight of 700 or 800 pounds, a welding heat is taken, and they are rolled down into plate. The outside of these plates looks very smooth and handsome, but if the attempt is made to clean them in acid, they are eaten into ridges, and sometimes holes are made entirely through them. Or if a piece is hammered cold on the edge, it is split into fragments, from the imperfect welding of the scraps together. These large plates are also defective when made from blooms. When a bloom, weighing 80 or 90 pounds, is put under a heavy hammer, the dross in the middle of it is forced out, but a bloom weighing 600 or 700 pounds, may be worked with a great mass of scoria in the middle; and thus, though the iron may be good, the plate is very defective. The speaker had worked hundreds of tuns of American iron into wire, and he had never found a single tun of it that would draw down into small sizes—small enough for card teeth. Some of it is so cold short that a rail falling from a wagon has been known to break in three pieces. Our charcoal iron, if properly worked, is the best iron in the world, and will make the best plate. It should be hammered and rolled from small blooms, and the piles for plates should be built up by piling pieces of bars crosswise, so as to have fiber in all directions.

AN EMPTY BOILER EXPLODING.

Mr. Wiard said that a boiler belonging to J. D. Morris, of Philadelphia, exploded under very peculiar circumstances. The fires had been drawn and the water blown out, and a man was putting out the coals by sprinkling them with a hose; he directed the stream into the furnace so that it came in contact with the hot bottom of the boiler, and the boiler burst.

SINGULAR HOT BLAST FROM A BOILER.

Dr. Rowell said that sometime since, Mr. Wood, of Brooklyn, was burned, in a very singular manner, by a hot blast from a boiler. He had emptied a boiler to put in a new cock, had drilled a hole for the cock and was cleaning it out; cold water had been running into the boiler two hours and a half; he held a lamp to the hole to examine it, when there came from the boiler a hot blast of air that burned through Mr. Woods coat, vest, and shirt, and blistered his breast. The blast of hot air was immediately followed by a rush of air into the boiler, with a roar louder than that of blowing off steam.

EXPLOSION OF AN ALCOHOL BARREL.

Dr. Rowell also gave an account of the explosion of an alcohol barrel that he witnessed. He was in a drug store in, Catherine street, when he saw the proprietor sitting on a barrel and dropping lighted matches into it; the matches were all extinguished as they entered the spiggot hole. An acquaintance asked the man what he was doing. He said that there was about a pint of alcohol remaining in the barrel and he was trying to set it on fire. His friend observed, "You had better look out or you will have an explosion." The man on this hint, rolled the barrel out of doors, and, lighting one end of a long roll of paper, thrust it through the spiggot hole. An explosion took place, the lower head of the barrel was blown out, and the remainder was thrown thirty feet into the air, with the fire streaming from its lower end like a rocket. Dr. Rowell left the man pondering the problem of the sort of curve that he would have described if the barrel had gone off when he was sitting on it.

SUDDEN FORMATION OF STEAM.

Mr. Dibben said that if, after an engine has been stopped for some minutes, the safety valve is suddenly raised and instantly closed, the mercury in the gage will jump up, showing a sudden increase of pressure. This is most observable in boilers having small steam space in proportion to the water space. The speaker supposed that the increase of pressure results from the water, after the air is expelled from it, becoming in its quiescent state heated above the temperature due to its pressure, and then on being disturbed, giving up this heat to the formation of steam. It has been suggested, by Tyndall and others, that this may be one cause of boiler explosions, and it would seem to be especially applicable to Western boiler explosions, which usually occur on starting the engine after a period of rest, and in boilers having small steam space in proportion to the water space.

Granite and Iron Fortifications.

The Ordnance Select Committee and a great concourse of engineers and artillery officers, were in attendance on Thursday, the 15th Nov., to test an experimental granite casemate, with two embrasures protected by iron shields. The total frontage of the masonry is 50 feet in length by 20 feet 5 inches in hight. The greatest thickness of the granite piers is 14 feet, including 2 feet of brick-work inside. The eastern or largest embrasure is 12 feet by 8 feet, and the western is 6 feet by 6 feet. The former is filed with a built-up shield, the latter with a solid plate of iron, 13½ inches thick, each shield having an embrasure or port-hole 3 feet by 2 feet 4 inches. The shield for the large embrasure has a front plate of 4 inches thick, and a backing of thin iron plates 8 inches deep, their outer edges supporting the front plate, and their inner bearing on a second plate of 2 inches in thickness. This, again, rests upon a cushion of teak timber, 6½ inches thick, the whole bearing on a skin of inch iron, and bound together by 22 bolts of 3 inches diameter, and 16 bolts of 2 inches, all having shallow square threads. The skin is attached to two struts by double-angle bars, 6 inches by 4½ inches by ¾ inches, and strengthened by six similar bars, running at right angles to the struts. A strong girder, 20 inches deep, strengthens the shield across the top of the embrasure. The struts to which the shield is attached, rest upon a bottom plate of inch iron, 3½ feet wide, and through this plate the entire mass is secured to the stonework by ten bolts of 2½ inches diameter. This shield owes its origin to the successful trial of the Chalmers target in April, 1863, and the recommendation of Lord Palmerston, who introduced the inventor to the Secretary of State for War. As originally proposed, the principle was the same as the Chalmers target, but at the suggestion of the late Iron-Plate Committee, and the engineers of the War Department, it was altered to its present form. For the compound backing, or alternate layers of timber and iron, of the original design, the present backing of layers—all of thin iron—was substituted, on the ground that it was not advisable to introduce such a perishable material as timber in a permanent work. Half of the shield, therefore, has a backing of plain bars 8 inch by 1 inch, and the other half has bars which match or bind into each other. The latter were suggested by Mr. Chalmers, and their adoption for the entire shield would add £10 to its cost. These alterations, while they still leave a cushion of timber in the very heart of the structure, add greatly to the weight and cost of the shield, without improving its powers of resistance.

This shield has cost over £1,000 (independent of the consideration paid to Mr. Chalmers for the invention, and for superintending its construction—£600,) but a shield of the same size, on the plan originally submitted, which the inventor thinks would offer greater resistance to shot, would cost only about half this amount. Mr. Chalmers has also submitted to the War Department a plan of a shield suitable for the smaller class of embrasures, which, he thinks, would not cost over £300. The size of the large shield is 12 feet by 8 feet, its weight per foot 650 lbs., the total weight, including struts and foundation plate, is about 29 tons. The armor-plates were manufactured by Messrs. John Brown & Co., and the shield was constructed by Mr. H. Grissell, at the Regent's Canal Ironworks. The plate for the small embrasure was also manufactured by John Brown & Co. The right flank of the casemate is protected by an iron cramped wall, generally termed "the puzzle," because the pieces of iron bind into each other in the manner of certain puzzles, made of wood, for the amusement of children. The left flank is protected by 4½-inch armor-plates, backed with timber and concrete. The entire cost of the structure is about £6,000. The battery to test this structure is placed at 200 yards' distance, and consists of the following guns:—

7-inch shunt,	throwing a steel shot	of 115 lbs.	with 18 lbs.	charge
8	"	" 150	with 22	charge
9¼	"	" 250	with 30	charge
10	"	" 360	with 35	charge

The experiments on Thursday were confined to testing the shields, both of which proved a perfect defense against the 7-inch and 8-inch guns. The small or thick plate shield, however, was cracked on one side by the first blow from the 9-inch gun, and the 10 inch or 300-pounder broke it right across, virtually placing it *hors de combat*. Another shot would have driven it into the casemate, but that—perhaps to save the feelings of its projector (the superintendent of the works)—was withheld. No such merciful treatment, however, was afforded to the shield of the outsider, for when it did not succumb to the ordinary charges, the charges were increased to 41 lbs., and the firing continued till it was severely punished. At the conclusion, the fastenings were nearly all destroyed, but no shot had penetrated the target, nor was it displaced by the heaviest firing ever seen at Shoeburyness. The thick plate shield, which was disposed of at the fourth round, was struck by a total of 765 lbs. of metal propelled by 106 lbs. of powder; while the built-up, or Chalmers shield, resisted 2,442 lbs. of metal and 311 lbs of powder.

On the next day, Friday, the practice was commenced at the stoneworks. The guns were fired in salvoes, and the effect was to bring down the granite and brickwork in huge masses; the steel shells completely penetrated the massive granite pieces, 14 feet thick. A few shots were, on the succeeding Wednesday, fired at the Chalmers embrasure from the 10-inch gun, four of which struck in about 2 feet square at the right upper corner of the embrasure. Weight of steel shot, 280 lbs., powder charge, 41 lbs. As each shot struck, the massive granite keystones over the embrasure were forced out of their place, and the vaulting inside the embrasure fell in. The embrasure itself was not penetrated, although the armor-plates were cracked, and the backing much bent, the bolts also giving way. To sum up, 80 shots in all have been fired at this granite work and embrasure, and the whole are in ruins; so much for a combination of granite and iron work.—*Mechanics' Magazine.*

THOMAS B. STILLMAN.

Engineers and mechanics in this city have lost a good friend and wise counsellor in Thomas B. Stillman; he died a few days since at his residence in Plainfield, N. J., of pneumonia. Mr. Stillman was for a long time connected with the Novelty Iron Works, in this city, and was also the pioneer of the steam coasting trade. The *Northerner* and *Southerner*, plying between New York and Charleston, being the two first vessels. Mr. Stillman retired from the Novelty Works in 1852, but since that time has been interested more or less in steam navigation, particularly the revenue service—the finest vessels in this branch of the national marine being projected by him. To working men Mr. Stillman was always kind and considerate, and many who have been accustomed to look to him for counsel will grieve when they learn of his death.

CORK CUTTING.—The Springfield Cork Manufacturing Company are just entering into business. They have bought the entire Harris' Patent, of a cork cutting machine, and have one set up. The machine is a novelty, as in cutting the corks it makes a slight thread upon them. Most corks used in this country are imported. Norwich, Conn., has an establishment where very excellent corks are cut by power, and there is a lesser establishment, we believe, at Pawtucket, R. I., where the cutting is done by hand. The enterprise promises to develop into an important manufacture.—*Com. Bulletin.*

Correspondence

Boiler Explosions.

MESSRS. EDITORS:—In looking over an old volume of *Silliman's Journal*, Vol. XL., page 32, I came across some curious statements of facts, with conclusions deduced therefrom, contained in an abstract of the proceedings of the American Philosophical Society in 1840. In this it is stated that a vessel of great strength, subjected internally to a powerful hydraulic pressure, was collapsed or burst inwardly by suddenly removing the internal or outward pressure, and that the subject was analytically investigated by Prof. Bonnycastle, a distinguished mathematician, who demonstrated that the crushing pressure on an elastic vessel, for a single instant or brief period of time, would be equivalent to the sum of the removed outward pressure added to the atmospheric pressure.

If this conclusion is properly stated and correctly arrived at by Prof. Bonnycastle, may it not be possible for a partial vacuum to be suddenly produced on starting the engine, reducing the fires, throwing cold water into the boiler, etc., which would subject the boiler to a tearing inward strain, or start an incipient rupture in it, so that the outward pressure, when restored, would burst it? The force of the instantaneous inward pressure would apparently be measured by the difference in the two consecutive states of pressure, and might thus, perhaps, be quite powerful, even though the residual outward pressure was more than sufficient to counteract the atmospheric pressure. The boiler is, of course, weaker to resist an inward than an outward pressure, tending to change its form, and it is to be considered that the nature of the action is percussive, or like that of a powerful blow.

Whether the conclusions of Prof. Bonnycastle are applicable to boiler explosions or not, can easily be tested by a few simple experiments, which, it seems to me, are worthy of trial. HENRY F. WALLING.

New York, Dec. 30, 1865.

Traction Engines.

MESSRS. EDITORS:—It is a well-known fact that some railroad locomotives (if run fast enough) will develop 300 horse power. The rapid exhaust blows the fire and supplies the necessary steam. But, if the same locomotive was traveling at the rate of speed which we are obliged to come down to while running land locomotives on bad roads and steep grades, it would not develop at such speed more than 30 to 50 horse-power.

Now, one grand difficulty in all steam wagon arrangements has been, that when they needed a tremendous power to get over the bad portions of a road, that was just the time that they developed the least power, in consequence of having to travel at a slow rate of speed in such places. But where the road is good, and the wagon runs easy, they can develop the most power where it is not needed; and they never have developed more than one-third of the actual capacity of boiler and engine, except where it was not needed.

Now, I am happy to say that I have provided a simple remedy for this difficulty. In my traction engine, I can allow my piston to run any desired velocity, while the wagon is traveling at as low a speed as may be desired, can have full benefit of rapid exhaust to make a brisk fire and speed of piston to use the steam, and yet can gear up to any desired fast speed of wagon at any time when the resistance decreases, and do so without stopping to change gears. PERRY DICKSON.

No. 58 Dey street, New York.

Creosote for Preserving Timber.

MESSRS. EDITORS:—In answer to your correspondents, I may state that the best way to preserve timber exposed to the action of the weather is to force into the pores of well-seasoned wood as much carbolic acid, or creosote, as possible. This soon resinifies, and most effectually prevents the timber from dry rot and decay. On a large scale for railway sleepers expensive appliances are needed; but for barns or outbuildings it may be applied to considerable advantage by the use of a paint brush.

You are aware that I lately took out (through your Agency) a patent for creosote as a vehicle for paint, in combination with white lead.

EDWIN BATTLEY.

Chemical Works, Montclair, N. J., Dec. 26, 1865.

Hydraulic Motors.

MESSRS. EDITORS:—In one of your numbers, a few weeks past, you had an article on "Hydraulic Lifts," and spoke of the "*Palladium*" wheel, and said you did not know under what head of water the wheel run. I am running a wheel of the same make on the opposite side of the street, and there are two others of the same kind running within two hundred yards of us. We get about 40 lbs. pressure to the inch from the hydrant—we all take a one-inch stream. I have two sets of polishing wheels running, as large as used in gun shops; four upright drill presses, one screw machine, four milling machines, one No. 1 press, one reming machine, one machine for running emery wheels for sharpening tools, and one lathe for making tools.

The work done is generally light, but the power has agreeably disappointed me. I have three machines that make 3,000 revolutions, and the wheel (water) only makes forty-five, with full pressure on, and if the belt was thrown off it would not make fifty. The Water Co. think this the most economical wheel. EDWIN WANT.

New Haven, Conn.

[We are obliged to our correspondent for his interesting letter, but regret he has omitted to state the size of the motor. We learn from other sources, however, that this is the Stannard motor, and is about twelve inches in diameter.—EDS.

Working Cast Steel.

MESSRS. EDITORS:—I notice an inquiry about welding two pieces of cast steel together, in your paper of the 9th December, and would say that I have no trouble in welding with borax alone; but by putting on sharp sand, when the heat is near a borax heat, the heat can be raised much higher without burning the steel. I find it is generally believed that cast steel is spoiled if it is burned; if it is cooled and the grain not separated by a jar, or otherwise, it can be re-worked without any damage at a low heat. H. W.

Beetown, Wis., Dec. 20, 1865.

DECAY OF GUTTA-PERCHA AND INDIA-RUBBER.

From a report made some time since to the Chemical Society—England—by Prof. William Allen Miller, M. D., F.R.S., it seems that India-rubber and gutta-percha, when exposed to the atmosphere, gradually absorb oxygen, and combine with it to form resin; acting in this respect like other hydrocarbons. Prof. Miller says:—

"The inquiries to which this investigation has given rise have extended over many months, and have included a large number of analyses, but the results obtained may be stated in a small compass, as they are very definite. I have examined numerous samples of gutta-percha cables, both injured and sound, which have been in use for several years, and I find in all cases that the deteriorated portions have undergone chemical change, and that change consists in a process of oxidation.

"Whatever retards or prevents this oxidation, retards or prevents the decay of the gutta-percha, some of the specimens which I examined being as good as new, though they had been manufactured and used electrically for years; while others in a few months had become brittle, rotten, and unserviceable. As the general result of these inquiries, I find that, whenever the gutta-percha has been completely submerged in water, no injurious change has occurred, sea-water appearing to be eminently adapted to the preservation of the gutta-percha. On the other hand, alternate exposure to moisture and dryness, particularly if at the same time the sun's light has access, is rapidly destructive of the gutta-percha, rendering it brittle, friable, and resinous in aspect, and in chemical properties. A gradual absorption of oxygen takes place, and the gutta-percha slowly increases in weight, becoming at the same time proportionately soluble in alcohol, and in dilute solutions of the alkalies. In every instance, however, some portion of the gutta remained unchanged in composition.

"My experiments have also been extended to the prolonged action of air, moisture, and light, upon india-rubber, and here also I find that these agents effect analogous changes, though somewhat less rapidly.

"The caoutchouc, however, instead of becoming brittle, is converted into a glutinous mass, losing its elasticity, increasing in weight to a certain extent, and becoming partially soluble in alcohol and diluted alkaline liquids.

"These deductions are made from the examination of a number of samples supplied to me partly by Capt. Galton and Mr. L. Clark, including specimens of coated telegraphic wires suspended in air, specimens of submarine cables, specimens of wires sunk in the soil under various conditions, besides experiments instituted by myself upon the action of various agents upon gutta-percha, and they include the results of an extended and well-contrived series of experiments made at the works of the Electric Telegraph Company, under the direction of Mr. L. Clark."

Among the analyses given by Prof. Miller are the following:—

"Pure gutta-percha differs in some of its properties from the commercial gutta. I found on examining the whitest samples, purified by Dr. Cattell, that it formed a porous, milk-white mass, wholly soluble in benzol, in ether, in bisulphide of carbon, and in the ordinary solvents of gutta-percha. It is a perfectly pure hydro-carbon, probably containing C_{20} H_{30}. I found it to consist of—

	Found.		C_{20} H_{30}.
Carbon	88·96	or	88·88
Hydrogen	11·04	or	11·12
Total	100·00	or	100·00

"When exposed to a temperature of 212° it softens, but does not liquefy; it loses a trace of moisture, and then gradually absorbs oxygen, becoming brown, brittle, and resinous in appearance. In one specimen the increase in weight amounted to 4·45 per cent. The oxidized portion is insoluble in benzol, which, when digested on the brown mass, dissolves out a quantity of unaltered gutta, which had been protected from oxidation by the coating of resin.

"This resinous mass when thus purified was found to have been produced from the gutta-percha by simple absorption of oxygen, the gutta having in one experiment absorbed more than a fourth of its weight of oxygen from the atmosphere.

"The caoutchouc of commerce is, like gutta, not a pure vegetable principal, and consists of a hydrocarbon of definite composition, mixed with a small quantity of resin, the amount of which varies in different specimens.

"The following are the results of my analysis of a sample of pure unmanufactured Para rubber, compared with a sample of good sheet masticated or manufactured rubber:—

	Virgin.	Masticated.
Pure caoutchouc	96·6	96·64
Moisture	1·3	0·82
Resin	1·8	2·06
Ash	0·3	0·48
Total	100·0	100·00

Or, deducting moisture and ash, its elementary composition gave:—

	Virgin.	Masticated.
Carbon	85·82	85·53
Hydrogen	11·11	12·06
Oxygen	3·07	2·41
Total	100·00	100·00

"Caoutchouc, like gutta-percha, is, as already stated, liable to deterioration, by exposure to the action of oxygen in the presence of solar light, but the gum is less rapidly injured if exposed to their influence in the native state, than if it had been previously masticated. When subjected to the action of air excluded from light, it does not experience any marked change, even during very long periods. It is, however, important to observe that the masticated rubber is much much more porous than the unmanufactured caoutchouc. When immersed in water, caoutchouc absorbs a much larger quantity of this liquid than gutta-percha, and the masticated much more than the unmanufactured or virgin rubber."

THE public debt of the United States, less cash in the Treasury, on the first of January, amounted to $2,716,581,536 19.

RECENT AMERICAN PATENTS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week; the claims may be found in the official list:—

Alphabeticon.—This invention relates to an apparatus which is intended to facilitate the otherwise tedious process of learning the first rudiments of any language for which the apparatus may be prepared. It consists, principally, of an upright wooden frame, the sides of which are composed of solid boards, and provided with apertures and suitable slides, in combination with a disk which revolves on a central axis that has its bearings in the sides of the frame, and which is marked with dipthongs, consonants, and vowels of a certain language, and also, if desired, with the figures from 0 to 9, said letters being arranged in annular spaces, opposite the apertures in the sides of the frame, in such a manner that, by turning the disk, any dipthong, vowel, consonant, or figure, can be brought opposite the appropriate aperture and exhibited to the view of the pupils; and after such letters are fully known by the whole class, additional letters can be introduced into the slides extending from either side of the apertures, and by these means parts of words, or whole words, and also numbers of more than one figure, can be taught, simultaneously, to a number of pupils with the greatest ease and facility. J. H. R. Reffelt, of Hoboken, N. J., is the inventor.

Adjustable Cut-off.—This invention relates to a cut-off in which the valve is trippel by the action of a combination cam, or a cam formed of a series of cams of decreasing length, which is self-adjusting on its axis by the motion of the governor, in such a manner that, when the speed of the engine increases, and the balls of the governor fly out, the cam is brought in such a position that the valve is kept open for a shorter time than it is when the speed of the engine slacks off and the balls of the governor sink down. The several cams which form the combination cam are made V-shaped, and they operate, in combination with a V-shaped friction roller at the end of the valve stem, in such a manner that the governor is prevented from moving the cam while the valve is being seated, and the length of the several arms is so adjusted in relation to each other that each cam cuts off at a certain constant or regular percentage on the one immediately preceding, thus differing from ordinary cut-offs, which cut off at equal intervals on the stroke of the piston. A. W. Foster, Jr., of Pittsburgh, Pa., is the inventor.

Draining Pump.—The object of this invention is an improvement in pumps adapted more especially for draining purposes, because it is not liable to be put out of order or to be stopped up in pumping muddy and refuse water. It consists of a hollow cylinder, within which are placed two series of vanes whose adjacent ends are connected, although each series, in other respects, is distinct from the other in form and position. Those vanes which are nearest the induction end of the cylinder are nearly straight, while those of the other series are spiral. The latter, moreover, are surrounded by a circular case which nearly fills the cylinder, and they are mounted upon a hub or axis whose diameter is about one-half the diameter of the cylinder. Next to this series of vanes is a frame containing four radial blades, fixed within the cylinder, each blade being in a plane parallel with the axis of the cylinder. Their purpose is to counteract the tendency of the water to rotate after it has left the vanes, and direct it onward toward the place of discharge. Wm. S. Nelson, of St. Louis, Mo., is the inventor.

Gang Plow.—This invention relates to a gang plow, and consists in a new and improved mode of attaching the head block and plow beams to the axle, whereby the tongue is allowed to move freely in any direction, and the team relieved from side draught as well as from downward pressure of the draught pole, and the plows held or retained in a proper working position. The invention consists, second, in a novel arrangement of the plow beams, whereby the same may be conveniently raised and lowered, and made to penetrate the desired distance into the earth, according to the depth of the furrow desired, at the same time causing the plows to be supported by the machine so as to obviate much friction and insure a light or easy draught. The invention consists, third, in the manner of adjusting one of the wheels of the machine, whereby the same may always be kept level, said wheel being adjusted higher or lower, according to the depth of the furrow in which it runs. H. C. Smith, of Ridge Farm, Ill., is the inventor.

Oven for Drying Fruit, Baking and Roasting Meats, and for Other Purposes.—This invention consists in constructing an oven intended for drying fruits, and for other purposes, with a chamber or space around its side, top, and bottom, so that the heat and products of combustion from the furnace, which is situated under the oven, will act on all sides of the oven walls during their passage to the flue—the oven being provided with a number of ventilators, whereby the heat of the same may be regulated as desired. An oven thus constructed can be used for ordinary household purposes, such as baking, roasting meats, etc., with as much advantage as for drying fruit. It can be quickly heated to an intense degree, and it will retain the heat for a great length of time. John I. Boone, of West Milton, Ohio, is the inventor.

Tool or Drill for Boring Rock.—This invention consists in forming the cutting or reducing surfaces of tools or drills, for boring rock, of sapphires, arranged on the face of a crown or stock, so as to make a series of grinding faces or surfaces, by rotating or reciprocating which upon the rock to be bored, the latter will be gradually reduced by abrasion or grinding. Lorenzo Dow, No. 170 Broadway, New York, is the inventor.

Something Really Novel.

Many of our readers may have failed to notice, in our weekly list, the following remarkably funny specification. Does the inventor mean a pun in the last lines? "This invention relates to means for determining the truth or feasibility of alleged spiritual manifestations. The inventor constructs a close room, and uses peculiar light therein. He paints the walls, floor, and ceiling with care, and filters the light that is used. The room must be close, and have no open door or window. It should be air-tight, though some air may be admitted for ventilation, but it is better to have a reservoir of air held under pressure in a tank in the room, to be allowed on turning a faucet, to escape into the room for comfortable breathing. It will issue from the room through unavoidable apertures. The light used may be that from the combustion of hydrocarbon, but it should be made to pass through a liquid, colored blue, black, or violet. So little light should appear through it (however much gas may be burned) that the room will seem entirely dark at first, but the person shut in will grow to perceive the light, and objects in the room will become visible. In such a room, with this light, there will be a chance, if any chance exists, that spirits may become distinctly visible. The reason that spirits are not seen, it may be assumed, is that the light is too coarse; it passes through them, and does not reflect from the surface. In order to see them at all, it would, therefore, appear that the light must be exceedingly minute, and, therefore, it must be filtered. The kind of paint proper for painting the walls, floor, and ceiling of the closed room, is that which in chemistry is known as being akin to carbon. Dolomite or magnesia properly prepared is good. Spirits of turpentine or alchohol may be employed for mixing the paint."—*Engineer.*

The curious substance called glycogen by Claude de Bernard, was extracted by him from liver, by the following process:—The liver of an animal recently killed was cut into thin slices and thrown into a small quantity of boiling water. The whole was allowed to boil for an hour, and was then submitted to pressure. A small quantity of fluid was obtained, which, when treated by alcohol, yielded a white flocculent precipitate, and this, when re-dissolved in water, and re-precipitated by alcohol, was then found to yield with iodine and other re-agents the characteristic properties of amylaceous substances.

The number of patents to be issued from the Patent Office for the week ending January 9th is 102, a considerable falling off as compared with the issues of the last two months.

Gas-Lighting.

William Murdock, whom Mr. Smiles, in his biography of Boulton and Watt, styles "the mentor of the firm," is "entitled to the merit of inventing lighting by gas." He was the first to apply a long-known scientific fact "to practical uses." He lighted his house and offices at Redruth with gas early in the closing decade of the 18th century; and in 1802, in celebration of the peace of Amiens, he astonished the people of Birmingham by illuminating the front of his employers' factory (Soho) with gas. In 1803 he lighted the whole works with gas, and thenceforward the new light was regularly used by Boulton and Watt. Other firms followed the example in various parts of the country. Some years afterward, when the scheme of Winsor, or Wintzer, a German, was before Parliament, and Murdock was examined as an opposing petitioner, "Do you mean to tell us," asked one member, "that it will be possible to have a light without a wick?" "Yes, I do, indeed," answered Mr. Murdock. "Ah, my friend," said the legislator, "you are trying to prove too much." "It was as surprising and inconcelvable to the honorable member," says Mr. Smiles, "as George Stephenson's subsequent evidence before a Parliamentary committee, to the effect that a carriage might be drawn upon a railway at the rate of twelve miles an hour without a horse." The proposal to light towns with gas was laughed at. Even Sir Humphrey Davy ridiculed the idea. He is said to have declared the project to be as absurd as to think of illuminating a dark night with clipped moonshine; and he asked one of the projectors if it were intended to take the dome of St. Paul's for a gasometer? Sir Walter Scott, too, had his fling at the notion of lighting London with smoke; but, like many other crotchets that have been derided, gas-lighting made way; and Mr. Smiles reminds us that it was popularly supposed, in the early days, that the gas made use of was carried along the pipes on fire. We know, indeed, that when the excavators were digging trenches in one of our north country towns, for the reception of the pipes, and the usual number of amature clerks of the works were looking on, the question was gravely asked if the gas would come up between the stones in flame. One old lady was so alarmed by the operations that she threatened to withdraw her custom from shopkeepers who should introduce gas-light; and, indigrous and incredible as it may now appear, there were families that removed to watering-places before the experiment was made, and did not return until the town which they had thus put in quarantine was declared safe! The lighting of thoroughfares with gas was introduced on the 31st December, 1812, when Westminster Bridge was illuminated; and the disgusted lamplighters shortly afterward "struck" against the innovation, and Mr. Clegg had to light his own lamps! The parochial authorities of St. Margaret's, Westminster, were the first to enter into a contract for lighting their streets with gas, and oil was superseded April 1st, 1814. Newcastle, whose streets were first lighted with oil the 29th September, 1763 (an improvement not extended beyond the walls of the town until September 26th, 1812), introduced the new light on the 10th of January, 1818, when some of the shops in the town were illuminated with gas.

The arrangements of the directors of the Atlantic Telegraph Company as to new capital are now completed, and several hundred miles of the cord are finished. The *Great Eastern* is chartered to go to sea in June, 1866, for the double purpose of laying an entirely new cable, and of raising the broken end of the 1,100 miles of cable laid this year, so as to splice additional cable to, and thus, if successful, furnish to the public a second means of communication. This 1,100 miles of submerged cable is ascertained to be in the most perfect order, by tests taken at the time it broke, and still continued daily. The buoys at the end of it are washed away, but this is of no consequence, as they were intended only for a temporary purpose, the spot for grapnelling having been laid down by solar observations, so that a good navigator can at any time sail to within half a mile of the broken cable.

Effects of an Inflated Currency.—Wages of common laborers in New Orleans are six dollars per day.

Improved Chimney Top.

This engraving represents a new chimney top, intended to accelerate the draft, and prevent chimneys from smoking by air descending in counter currents.

It is shown in two forms, one attached to the common chimney; in the other as a cowl, or hood, as it is sometimes called. To the pipe, A, a flange, B, is fastened, and just above it another one, C, is secured to the first with spaces between, as shown. Just over the opening of the pipe is a cap, D, of conical form, in one view, and pyramidic in the other. The object of these details is to protect the main outlets, E, from sudden gusts of air that tend to create eddies, and cause the evils heretofore spoken of.

Currents of air naturally pass up the external space between C and B, and hereby produce a partial vacuum in the pipe, which has the desired effect, since the air below rushes up through the fire to restore the balance.

The flange, B, is tight around the pipe, A, and no air passes through at the junction, but only above the same. It is claimed that this cap will cause fires to burn equally well whatever the direction of the wind, and from his model and theory we should judge his invention to be no fallacy.

Fig. 1

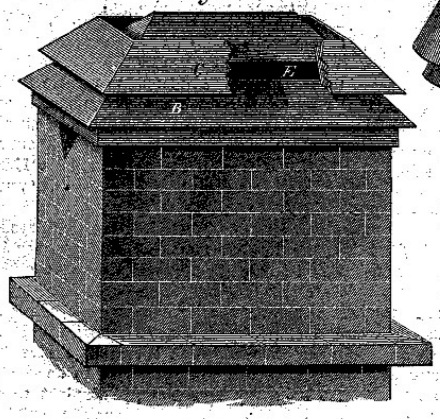
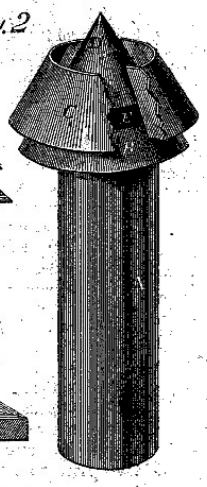


Fig. 2



HORTON'S CHIMNEY TOP.

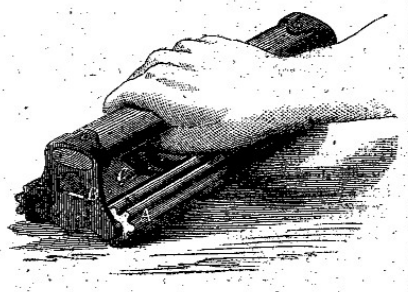
It was patented Sept. 19, 1865, by William H. Horton, No. 51 Montgomery street, Jersey City, N. J., to whom address for further information.

HAND WASHING MACHINE.

If washing day is not robbed of its terrors, it will be no fault of inventors. Continually they strive to take away from it the trouble, the swash of suds, the steam, and the reeking odor of soap that permeates the house. They strive to do this by the aid of machinery, and have been successful to a great extent.

We illustrate herewith a new utensil, which can hardly be called a machine, it is so simple, but will no doubt prove efficacious. It consists of two fluted rolls, A, attached to a frame, B, and fitted with a handle. There is also a perforated zinc trough, C, between the rolls, which brings the suds up on them so that it flows over the clothes.

The machine is used in a common wash-tub, on a washboard, and is rubbed over the clothes as in washing by hand. The fingers or joints are saved from rough usage by the utensil, and the work done



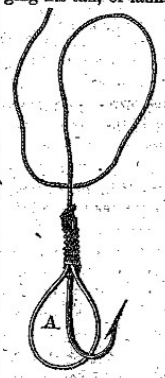
more expeditiously and in a superior manner. The low price at which this machine is sold (one dollar) will carry it into many families.

It was patented on Nov. 28, 1865. Address Hunt & Van De Mark, No. 259 Pearl street, New York.

LIVERMORE'S FISHHOOK.

What pen can record the anguish of a fisherman when he feels a strong bite but does not catch the fish? not ours. The disappointment is too great to be lightly alluded to, and we pass it with silent respect.

Fish have more cunning than men give them credit for. There are certain sly and scaly veterans of the brook, pond, or river, that know every wile and art of concealing the hook with bait; who are not to be caught by stratagem; who are not to be gulled by promises; who are not beguiled by soft words; who are not to be caught on any terms. Let down a line to these fellows, and if the water be clear you shall see them approach cautiously from behind the bait, give a quick snatch, seize it and away. Meanwhile the heart of the exultant angler above gives a great throb, his hands twitch the line convulsively, but the fish is already a rod away, tauntingly wagging his tail, or fanning his pectoral fins slowly back and forth in the most aggravating manner.



This is repeated until the angler's bait and patience are exhausted, and he then commences singing hymns and communes pleasantly with himself. On being asked for his fish, when he returns at night, he replies that he gave them to a poor woman.

Invention has circumvented these fishly wiles, and put it in the power of man to hold up his head once more unabashed. Behold here the remedy in this little engraving.

Attached to the ordinary hook is a wire guard, A. This projects toward the rear, where the outlaws attack the bait; consequently they cannot get at it, but go round to the front, where they are caught at once. This hook will catch every fish that bites. Our friend who sends it informs us that he has tried it thoroughly, and that it has never failed to bring the fish to light if he bites. There is no alternative; the bait must be taken from the front, which is very disagreeable to the fish, but pleasing to the fisher. All anglers and sportsmen generally will appreciate this little device and see its advantages at once.

Patent allowed through Scientific American Patent Agency, Nov. 18, 1865, by Dr. H. B. Livermore; address him for further information at Ashland, Pa.

Queer Telegraphing.

The following are copies of a telegram received by a correspondent of the *Times* resident at Newcastle-on-Tyne, from Lisbon (per the British and Irish Magnetic Company), No. 1, as originally delivered, and No. 2, the repeated message from London. "No. 1. Preal arrived and verm salus ropers inferorm visitoess lobb veut per continued." "No. 2. Preak arrived sud verm sains ropers inferorm vistoess lobl veut per continued." Add to this that the message was nearly three days on its way, and we have a fine specimen of modern telegraphy. Slight mistakes may be overlooked, but it is unpardonable for any company, British or foreign, to transmit such rubbish as this.

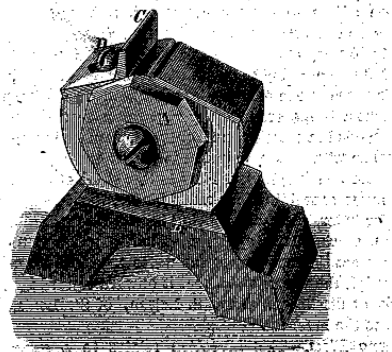
Patent for a Perpetual Motion Refused.

In invention was provisionally specified by Mr. Samuel Young, of Manchester, Eng. (but protection was refused), relating to the production and application of motive power by the means of weight; the improvement consists in the novel combination, construction, and arrangement of mechanism for applying the power obtained to a crank shaft, so as to constitute an engine. The weights are to be applied in the form of ordinary governor balls, connected to a slide which presses upon one end of a series of bell crank levers, and so causes another lever to slide or move a cylinder, having a diagonal rib on its surface along a keyway on the crank shaft, which sliding movement causes the ends of two levers to act against the diagonal ribs, so as by their friction to effect the revolution of the cylinder and crank shaft, the opposite ends of such levers also transmitting motion to a sliding block or spring, which is connected by a rod to a crank on the crank shaft, from which the governor balls receive motion. Thus it will be seen that when the power of the engine is beginning to be spent, the weight of the balls, by falling and pressing the levers, maintains the working power. It will at once be seen that the arrangement could not work, because the weights have to overcome all the friction of the machine, and yet, by their fall, to raise themselves again. The refusal of the protection for such an invention, is alike advantageous to the inventor and to the public.

RUSS'S SCISSORS SHARPENER.

This engraving represents one of those convenient little affairs which are so handy at times. It is for sharpening scissors, and is arranged to accommodate any degree of angle in the edge. The details are as follows:—

The cutter, A, is screwed to the side of the standard, B, which has a metallic guard, C, to give the right inclination to the blade sharpened; by the aid of the set screws and slot, D, the angle formed at the junction of the guard and cutter can be varied, thus fitting it for shears of all kinds; as the cutter is octagonal in shape, it has eight different cutting edges, and will last a long time. It is made of the very best cast steel, extremely hard, and otherwise neatly got up. This little utensil will be found very useful to housewives and others, for by the aid of it a sharp



pair of scissors can be had in a moment, it being only necessary to draw the blade across the cutter, once or twice, to accomplish the end desired.

It was patented Dec. 12, 1865, through the Scientific American Patent Agency. Address for information Russ & Eddy, Worcester, Mass.

Brick Machines.—We have frequent inquiries from our readers in various parts of the country for brick machinery. We think that manufacturers of such machines would consult their own interests by keeping advertisements in the Scientific American.

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NEW YORK, SATURDAY, JANUARY 13, 1866.

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Every man who has money to invest always desires to place it where it will make the best return. This being admitted, we undertake to say that $3, invested in the SCIENTIFIC AMERICAN, will return three-fold in the amount of valuable information which its columns supply. Mechanics, inventors, manufacturers, farmers—as well as every head of a family—will get, on an average, $10 worth of information from a year's number of this journal, and yet they can get it for the low sum of $2 50, in clubs of ten names.

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MANIAS.

Strange passions seize upon mankind at times. At certain periods hundreds of people are employed in collecting bits of paper with autographs of great or little men upon them. Coins have their value, pictures are eagerly bought up, old china is in the greatest request, old mahogany is highly prized, Dutch tulips command monstrous prices, and, lately meerschaum pipes and postage stamps have claimed attention.

All these freaks of human nature are taken advantage of by shrewd individuals of a speculative turn of mind who desire to turn a penny, honest or otherwise. So soon as a demand arises for any particular object or article, there are persons who supply it. There are more bullets from the field of Waterloo in existence than ever were fired on it. There are clubs enough that killed Captain Cook, in museums, to start a fire under a steam boiler with; and as for the "old masters," one can buy a Leonardo da Vinci in almost any second-hand store. The makers of "Indian" arrow heads, said to have been found on the early battle fields of the country, once drove a profitable trade; and in the matter of coins, we can have "Washington" pennies, or any other rare one, struck off at short notice by die-sinkers.

Meerschaum pipes, but lately objects of popular affection, were and are counterfeited in every possible material, as many who paid fancy prices found to their cost. Seventy-five and one hundred dollars were common figures for anything out of the ordinary kind. If these valuable bowls failed to take on a rich brown hue in a short time or a long time, the owners of them fell into a green and yellow melancholy, and refused to be comforted.

Quite recently postage stamps have become such interesting objects to relic hunters that all the acquaintances of such persons are made to pay tithes of all they possess. No matter in what quarter of the globe the stamps are issued, they are eagerly sought after and pasted in a book with a perservance worthy of a better cause.

These, too, have been counterfeited. Some French engravers have thought it worth their while to design a series of novel postage stamps, the like of which were never seen before. These stamps were represented to be the issue of the "Sandwich Islands" post-office, and as such were eagerly bought by confiding purchasers, who probably supposed that nothing was too absurd for that region. The Hawaiian stamps, not genuine, are orange, violet, green, and other colors of the rainbow lavishly interspersed. Says the Honolulu *Advertiser*: "The only genuine Hawaiian stamps are the following: One and two-cent stamps in black and blue, with figure in the center; two-cent stamps in rose color, with portrait of Kamehameha III. in the center, and in red with portrait of Kamehameha IV. in the center; five-cent stamps in blue, with figure in the center, and also in blue with portrait of Kamehameha III. in the center; thirteen-cent stamps in red, with portrait of Kamehameha III. in the center."

"Violet stamps" are, therefore, clearly to be taken under protest.

PLATING IRON WITH COPPER.

The following letter comes to us from South Newmarket, N. H.:—

I have some pieces of cast iron which have been bronzed, or, rather, have had a solution of copper deposited upon them. Can you give me any instruction in regard to the process? I have never seen anything of the kind in the SCIENTIFIC AMERICAN, but am informed that something of the kind did appear in it.

J. F. C. R.

A thin wash of copper may be deposited on iron by simply immersing the iron in a solution of sulphate of copper; but this coating forms no protection to the iron against the action of the atmosphere. As iron is positive to copper, when the two metals are placed in contact and subjected to corroding action, the action is confined to the iron, and an electric current is established which increases the action. A copper coating, therefore, to protect iron from corrosion, must so completely cover the surface as to absolutely exclude the air from contact with every part of the iron, and this is seldom, if ever, effected by the process of simple immersion. This process depends upon the stronger affinity of sulphuric acid for iron than for copper. Sulphate of copper is a compound of sulphuric acid and copper, and when iron is introduced the sulphuric acid leaves the copper and combines with the iron. There is consequently interposed between the copper and iron a thin film of sulphate of iron—green vitriol—a brittle and friable substance; this film is, however, so thin that the adhesion is surprisingly strong.

Iron may be perfectly covered with copper to any thickness by the process of electro-plating. Messrs. Smith & Butler, Nos. 449 Broome street, in this city, are now covering in this way a number of very large iron screws to be used for fastening the bed-plate to the timbers of one of our steam frigates. In order to prevent any action of acid upon the iron, a thin film of copper is first deposited from an alkaline solution. It is found that a current of higher intensity is required to decompose an alkaline than an acid solution—four of Smee's cups being required for the former, while one is sufficient for the latter. Therefore, after the screws are completely covered with a thin film of copper in the alkaline solution, they are transferred to a sulphate bath, and the deposit is continued to any thickness desired. Some of these screws are six feet in length and three inches in diameter, and they are being covered with a copper coating of a thickness equal to half a pound to the square foot.

QUEER PLACE FOR A CAVEAT.—A correspondent writes to us in regard to an invention, with becoming gravity, and states that he has filed a caveat for his improvement in the U. S. Mint, at Philadelphia, Pa.

THE WAY STEEL IS MADE IN JERSEY CITY.

Among our readers those who live in this city know very well that Jersey City is a suburb of New York, lying on the west bank of the Hudson, or North River, which bounds this city on the west. Among the numerous manufactories of Jersey City are the steel works of James R. Thompson & Co. They are situated on Warren street, and contain thirty-two furnaces for melting steel, with a powerful steam engine, tilt hammers, rolls, shears, and all the necessary appliances for bringing the metal into the proper form for market.

At these works the steel is cemented and melted at the same heat, the whole operation occupying only two and a-half hours. Plumbago crucibles, made by one of the owners of the works, Dr. Gautier, in the manner described on page 24 of our current volume, are filled with a mixture of wrought iron, steel, and charcoal, covered with a loose lid, and set in furnaces where they are subjected to an intense heat till the iron is converted into steel, and the steel is melted, when the metal is run into ingots in cast iron molds.

Each crucible or pot holds about sixty pounds of metal; it is filled with punchings of boiler plate and other kinds of scrap, with five to fifteen per cent of steel, and a small quantity of pulverized charcoal; the proportion of steel and charcoal varying with the quantity of metal which it is desired to produce.

The furnace looks like a simple cubical excavation dug in the ground, its dimensions being about two and a-half feet in all directions. It is, however a carefully built structure, with a grate and air passage at the bottom, with sides of fire brick, and with a flue to lead off the smoke. The furnaces are ranged in two rows, one on each side of the steam boiler, and the flues lead under the boiler, so that steam is made by waste heat from the furnaces.

Each crucible holds four pots, and for melting the steel these are buried completely in anthracite coal. The grate is first covered with coal to the depth of about eight inches, the pots are then set in, a wheelbarrow load of coal is shoveled into the furnace so as to surround and cover the pots, the top of the furnace is closed with a slab of fire-brick, and a powerful blast of air is driven through the fuel for two and a-half hours, when the iron is found to be converted into steel, the metal is melted, and the whole mass is mingled homogeneously together.

The furnace is now uncovered, and a workman, having his hands and legs protected from the heat by bandages of wet canvas, seizes a pot with a long pair of tongs fitted to grasp it, and lifting it out, carries it back a few steps to the mold. Here another workman grasps the pot sideways with a pair of differently shaped tongs, and pours its glowing contents into the mold. The molds are set on end, and the ingots are some four inches in width by two and one-half in thickness and fifteen in length, though the form varies somewhat with the form of the finished bar or rod for which they are designed.

After the ingots are cast, they are allowed to cool, and then for hammering and rolling they are re-heated in a reverberatory furnace. This cooling and heating is found necessary to give the best internal structure to the steel.

It seems at first a contradiction that heat should take carbon out of iron and combine it with oxygen, and then that heat should take carbon from oxygen and restore it to the iron. To make wrought iron from cast iron, the metal is melted and exposed to a current of air, when the carbon leaves the iron and combines with the oxygen of the atmosphere; then to return carbon to wrought iron so as to convert it to steel, the metal is packed in a pot with charcoal and heated. Though we are not aware that any writer on the subject takes this view, it seems to us impossible to doubt that in making steel, the carbon combines with oxygen before it combines with the iron. It is a maxim that solids exert no chemical action upon each other; either the iron or the carbon must be in either the liquid or the gaseous state, before they can enter into the combination. Though the metal in these pots is melted, the fusion must take place after the iron is converted into steel. If free carbon can be either fused or volatilized, it must be at a temperature higher than that of these steel pots, while it would combine with the oxygen present in the interstices so soon as the temperature had risen

to that of red heat. This combination would produce either carbonic oxide, CO, or carbonic acid, CO_2, depending upon the proportion of air and charcoal in the pot—in the actual conditions probably nearly always carbonic oxide. This would instantly take the gaseous form, and would be diffused through all portions of the vessel, coming in contact with all parts of the metal surface. We can conceive of no way in which iron, in these circumstances, can obtain the carbon to change it into steel except by the decomposition of carbonic oxide.

Messrs. James R. Thompson & Co. make steel to order of any quality that may be desired, varying the hardness and other properties by varying the proportions in which the several ingredients are mingled in the pots. In making the mixture the materials are carefully weighed, and the proper proportions can of course be determined only by long experience. The prices of the different qualities vary considerably, at the present time the range is from 13 to 23 cents.

DESTRUCTION OF BOILERS BY UNEQUAL EXPANSION OF IRON.

Mr. Norman Wiard may be doing a very valuable service in calling attention to the importance of providing, in the construction of boilers, for the unequal expansion of the iron in different parts of the structure. Mr. Wiard contends that if a very long plate of iron have one-half, extending lengthwise, heated more highly than the other, the heated half will be elongated more than the other, and thus a strain will be brought upon the dividing line tending to shear the plate in two.

At the last meeting of the Polytechnic Association, Mr. Wiard stated that he had tried the experiment with a plate ten feet in length. In order to obtain sufficient width to prevent the sheet from being bent edgewise, he had two plates riveted together at their longitudinal edges, then heating the whole red hot, he lowered one-half into a trough of water, immersing the plate to a depth just above the line of rivets. He says that the plate parted at both ends, the crack extending over two feet toward the middle, and running along the line corresponding with the surface of the water. Mr. Wiard's argument, is that in certain circumstances similar conditions may obtain in steam boilers. For instance, when an engine is at rest the steam may be superheated, the temperature of the plates above the water-line may be raised considerably above that of the submerged portions, and thus a shearing strain may be brought upon the plates along the water-line, which, if not sufficient in itself to divide them, may act in conjunction with the pressure to produce a rupture.

While there is a certain degree of plausibility in this idea, it seems to us that the rending of the plates by the different temperature of their parts is not the manner in which boilers are most likely to be broken by unequal expansion of the metal. Iron is so good a conductor of heat, and the superheating of steam in a boiler must proceed so slowly, it is difficult to conceive of any sharply-defined line between considerably different temperatures. The conditions are quite unlike those of a red-hot plate suddenly immersed to half its depth in cold water.

But, as we have already hinted, in the case of a complicated fabric, like most of the large steam boilers now in use, made up of hundreds of pieces of iron fastened together in various positions, and exposed in its different parts to widely different temperatures, it may be that strains are frequently exerted which will tear the fabric to pieces. These strains, though acting through short distances only, are practically irresistable in their power, and no stay or bolt could withstand them.

The effect of unequal expansion has made itself most manifest, heretofore, at the joints of the tubes in the tube-sheets, and it may be that boiler-makers should give more attention than they have to the less apparent action of this irresistable force in other portions of the structure.

THE oldest manufacturers of hollow ironware, in Troy, are Ingraham & Phillips, whose establishment on North Third and Fourth streets is 300 feet long by 120 wide, give employment to 150 hands and consume 12 tons of iron per day. Stoves are a specialty and last year they made 20,000.

PATENT-OFFICE DECISIONS.

THE LAW OF ABANDONMENT OF AN INVENTION.

Inferference between the application of C. W. Cummings for a patent for a Clasp or Snap, for Tobacco Boxes, and the patent granted to C. C. Ashley 20th Sept., 1864, for the same invention.

S. H. Hodges for the Board.—The application upon which Ashley obtained his patent was filed 6th July, 1864. His invention was then reduced to practice beyond question.

Cummings proves, on the other hand, that he had conceived the device in February, 1860, and that he had made such progress in maturing it about that time, that he had two tobacco boxes altered so as to exhibit it perfectly. On consulting an expert soon after he was advised that it was not patentable, and appears to have laid it aside. The testimony fails to show that he took a single measure with it afterward, until he heard that Ashley was about to obtain a patent for it. He thereupon filed his application on the 26th September, 1864, six days after Ashley's patent was issued.

The man who first reduces an invention to practice is, *prima facie*, the inventor, as is remarked by Judge Story in Reed *vs.* Cutter, (1 Story, R., 590.) He says farther, that the 15th Section of the Act of 1836 "seems to qualify that right by providing that he who first invents shall have the prior right, if he is using reasonable *diligence in adapting and perfecting the same.*" Since that time this distinction has been so often recognized that no principle can be considered more firmly established. He who first conceives an invention cannot maintain his title to it against another who matures it and reduces it to practice before him, unless he shows that he was exercising "reasonable diligence in adapting and perfecting it." Phelps *vs.* Brown, 18 How. Pr. R. 7, Ransom *vs.* Mayor, (Law's Dig. 427), Bartholomew *vs.* Sawyers, Id. There can be no pretence that Cummings was practising the assiduity required under these decisions from March, 1860, when he consulted an expert, till September, 1864, a period of four years and a-half. It does not appear that he once mentioned the device during all that time.

Cummings contends, on the other hand, that he had in fact matured the invention, and reduced it to form long before Ashley; that he had, in the very language of the statute, "adapted and perfected" it in the sample he prepared in 1860; and that he is therefore entitled to a patent in preference to any who might afterwards devise it. To this view there are very serious objections, and we cannot acquiesce in them without great hesitation. It would be entirely hostile to the spirit of the patent law, and be a great discouragement to inventors, if, after having tasked their ingenuity to contrive a useful improvement, and labored in perfecting it, and rendering it suitable for public use, they were liable to be defeated of their promised reward by having sprung upon them some secret experiment, of which the world had never heard; some achievement which had been buried in oblivion for years, and would never have seen the light had it not been for their labor and energy. In this very case the community would never have been the better for what Cummings did had it not been for Ashley's subsequent proceedings. The public owes the benefit of the improvement to Ashley and not to Cummings.

If the invention had gone into public use the case would be entirely different. It would be wholly immaterial how limited the use might have been, (Bedford *vs.* Hunt, 1 Mass. R. 302), the community would then obtain the knowledge of it. If not patented in two years it would become public property. But if a prior inventor can obtain the sanction of the Patent Office for achievements which have been kept secret, he not only defeats the meritorious inventor, but obtains the monopoly of a device which he has done nothing to bring into notice, or to give men the advantage of. We think this contrary to the spirit of the law. Some decisions certainly seem to sanction the opinion, that, in order to defeat a patent by showing a previous use or knowledge of the invention, the use or knowledge must have been such as to communicate the invention to the world. Gayler *vs.* Wilder (10 How. 477), Cahoon *vs.* Ring, (cited in Law's Digest, 450). To render the law on this subject systematic the previous experiments should be such as to amount to an abandonment, and invalidate a patent unless applied for in two years, or they should not have the effect of defeating a patent to a third person.

It must be conceded, however, that the courts of law have never gone so far. It is by no means certain that they would not pronounce Cummings' invention perfected, and hold him entitled to a patent against every one who originated it afterward. He is entitled to the benefit of this doubt. A decision in his favor is, moreover, the only way in which the question can be brought to a decision in the tribunals of justice. While we entertain strong convictions, therefore, that he ought not upon the merits to have a patent, it is evident that there is no other way in which he can have a fair trial of his title.

The primary Examiner decided in express terms that Cummings was the prior inventor, but, at the same time, held that he had forfeited his inchoate right by his delay, and rejected him on that ground alone, as it was understood Cummings appealed; and, as it was supposed that this brought up merely the question whether he had forfeited his invention by mere delay, irrespective of what Ashley had done, the decision was reversed by this Board the 13th September. Since that time Ashley also has appealed, and the question now raised is, simply, which is the prior inventor? For the reasons above given we are constrained to acquiesce in the finding of the primary Examiner, though it is with reluctance.

The decision of the primary Examiner is affirmed so far as he adjudges Cummings to be the prior inventor of the device in controversy.

U. S. Patent Office, December 6, 1865.

MAKERS of foot lathes and other lathes would no doubt find it profitable to advertise in the SCIENTIFIC AMERICAN. We have frequent inquiries for such articles from our readers.

ISSUED FROM THE UNITED STATES PATENT-OFFICE FOR THE WEEK ENDING JANUARY 2, 1865.

Reported Officially for the Scientific American.

Pamphlets containing the Patent Laws and full particulars of the mode of applying for Letters Patent, specifying size of model required and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

51,784.—Call Bell.—H. H. Abbe, East Hampton, Conn.:

I claim the oblique slot, a, made in a plate, E, or otherwise formed at the lower end of the sliding rod, D, in combination with the hammer arm, H, pivoted below the bell and the spring, G, on the rod, D.

[This invention relates to a new and improved call bell, of that class which are provided with a vertical rod passing through the bell and connected with the hammer arm, in such a manner that the hammer will be made to strike the bell as the rod is pressed down. The invention consists in a novel and improved manner of connecting the hammer arm with the rod, whereby the hammer is made to strike the bell twice during each depression of the rod, and a wider sweep or greater length of stroke given the hammer than usual.]

51,785.—Sealing Ring for Preserve Jars.—John Adams, Pittsburgh, Pa.:

First, I claim providing for removing the stopples of preserve jars, which are confined in place by atmospheric pressure, by constructing the india-rubber rings, a, that are interposed between the stopples and the mouths of the jars, with tongues, e, which are received in slots, c', formed in the stopples, substantially as described.

Second, Constructing the conical stopples, B, with slots, c', which are adopted to receive tongues on the sealing rings, substantially as described.

Third, An elastic sealing ring for preserve jars which has a tongue, e, formed on it as a new and improved article of manufacture.

51,786.—Horse Shoe.—John Austin, Rockford, Ill.:

First, I claim securing a shoe to the animals foot by means of the metal shaft, B, constructed in the form shown, and applied to the foot in such a manner as to rest in the recesses cut in the hoof, and secured to the shoe in the manner herein set forth.

Second, I claim a shoe having one side divided transversly and longitudinally as shown in Fig. 2, and having the lower portion, C, pivoted to the main portion of the shoe, substantially as and for the purpose set forth.

51,787.—Latch Fastening.—Henry N. Avery, New York City:

I claim as a new article of manufacture, the combined latch and padlock hasp herein described, consisting of the staples, d p, looped bar, a m, confining loop b, notch and aperture r, all constructed and arranged as and for the purposes herein specified.

[This invention relates to improvements in latch fastenings for doors of barns, out-buildings, etc., and consists in a novel attachment of the same thereto, as well also in the manner in which they are fastened by a padlock, or any other suitable locking device.]

51,788.—Steam Generator.—John Badger, Chicago, Ill.:

I claim the series of water chambers, D E F, and the reservoir, C, when constructed by the water pipe, G, and steam pipe, H, and all constructed and arranged substantially as and for the purpose herein specified.

51,789.—Knife Sharpener and Polisher.—Ephraim Beeman, Owego, N. Y.:

I claim the combination of the lever, A, with its castings of emory or other grinding material, and leather or other suitable material, the bed or base, B, and table, B, and the standard, M, and its joints, C D E, for the purpose specified.

51,790.—Gang Cultivator.—Charles Belden, Middlebury, Ohio:

I claim the blades, n, constructed as shown with a rib, p, and arranged in relation to each other, diagonally across the machine, in combination with the standards, m, and diagonal frame, O', substantially as and for the purpose set forth.

54,791.—Broom.—Sylvester Bennett, Hartford, Conn.:

I claim in the construction of corn brooms, the combination of the wood head, e, rebate, a, corn brush, b, band c, and handle d, substantially as described.

51,792.—Fruit Dryer.—John I. Boone, West Milton, Ohio:

I claim the oven or dry house herein described, consisting of the outer casing, A, furnace, B, apertures, b, interior chamber, D, and surrounding space or flue, C, all constructed and arranged to operate as and for the purposes specified.

51,793.—Bending Wood.—Isaac W. Bowers, Boston, Mass.:

I claim the elongated shoe or clamp, A B, with its bridge piece, C, between which the timber is wedged or confined while being bent.

I also claim bending the strap, E, around the portion, a, of the shoe or clamp, and securing it thereto by the screw, G, substantially as and for the purpose described.

51,794.—Loom Harness.—D. C. Brown, Lowell, Mass.:

I claim my improved heddle made substantially as described, viz., of the two wires, e and f, bent together and twisted and interloped as explained, the upper wire, in such case having but one holding loop, n, at its two extremities, and a warp eye, g, at its middle, and the lower wire having two holding loops, i i, at its two extremities and its loop or double at its middle.

I also claim the combination and arrangement of the four holding rods a a, b b, or the same and the bars, A B, with a series of metallic heddles formed of two wires, e f, looped together and having eyes, g h i i, substantially as explained.

51,795.—Baby Walker and Cradle.—John H. Brown, New York City. Antedated Dec. 28, 1865:

I claim the combination of the cradle form b i, with a seat, a, pivoted at c, on posts, d, the frame, e, and the springs, j and k, substantially as and for the purpose specified.

51,796.—Device for Superheating Steam.—Newton Brown and H. B. Gregg, Gratis, Ohio:

I claim the arrangement of the pipes, A and B, the transverse pipe, D, the vertical pipes, E, the cross pipe K, and the pipes, H and G, the whole constructed as and for the purpose herein set forth.

51,797.—Steam Car Brake.—X. X. Buckner, Boonville, Mo.:

First, I claim the steam cylinder, A, placed beneath the boiler of any locomotive, for the purpose of operating the brakes of a rail road cars.

Second, I claim the coupling heads, C B, for the purpose of uniting the different cars and connecting rods at one operation.
Third, I claim the spring bumpers, H, in combination with the bumper rods, H', and rods I' and P', as and for the purpose set forth.
Fourth, I claim the cylinder, A, in combination with the piston rod, P, connecting rods, P', levers, D, and rods, E D', and F, when constructed as and for the purpose set forth.

51,798.—Lantern.—Wm. Burns, Chicago, Ill.:
I claim holding a globe of a lantern in place, by means of a spring or springs, substantially as herein specified and described.

51,799.—Sashes and Frames for Windows.—Palmer L. Butler, Cape Vincent, N. Y.:
I claim, First, The combination with the sashes, B B', of racks, C C, pinions, D D, and extension plate, e, constructed and arranged to operate, as and for the purposes set forth.
Second, I also claim guiding the sashes in their vertical movements by means of the rack plates, C, and grooves, 2, substantially as above described.

[This invention relates to an improvement in the frames and sashes of windows, whereby the sashes are made to balance each other without the use of weighted cords, and their movements are made reciprocal, and the window pain is constructed with much more simplicity than by the mode of construction heretofore used.]

51,800.—Attaching and Detaching Breeching Straps from Shafts of Carriages.—Ezra Calderwood, Portland, Me.:
I claim the combination of the projection, H, and the shoulders, C C, with the cylinder, A, the spring, G, the plunger, L, and loop, E, all as and for the purposes specified.

51,801.—Operating Bored Wells.—Simeon B. Castle, Gortlandville, N. Y.:
I claim the combination of the drive point, a, and the drive head, b, with the connecting rod, C, the stone check, f, as shown at figure 4, and the bevelled pipe, d, as and for the purposes set forth in the said or above specifications.

51,802.—Lounge Bedstead.—Benoit Cerf, New York City:
First, I claim head board, F, combined with and attached to a lounge, bureau bedstead, or similar article, substantially in the manner described and for the purpose set forth.
Second, The frame, G, constructed and applied, substantially as described in combination with a lounge, bureau bedstead or similar article, substantially as and for the purpose set forth.

[The object of this invention is to furnish a convenient attachment to lounges, bureau bedsteads, and similar articles which unfold, to allow a bed to be prepared thereon, and it consists in combining with the folding part of said articles, a folding head board and side frame, by which the comfort of those using such a bed is materially increased.]

51,803.—Bolt for Window Shutters.—Edmund Childs, Philadelphia, Pa.:
I claim making the stop, C, of a bolt for a window shutter or door compressible, substantially as and for the purposes described.

51,804.—Book leaf Turner.—Cyrus C. Clapp, Hartford, Conn.:
I claim the combination of the rotating wheels, c, rack pin and wheels, p 1, key, g, and elastic cords, r, with proper connections for operating the same, substantially in the manner as and for the purpose described.

51,805.—Improved Salve.—David W. Craft, New York City:
I claim the above described medical composition, substantially as and for the purposes set forth.

51,806.—Well boring Machine.—L. J. Crans, Philadelphia, Pa. Antedated Dec. 21, 1865:
First, I claim the drill, B, in combination with the within described devices, or equivalents to the same, whereby the said drill may be caught, raised from the rock, and then released from the raising device, substantially as and for the purpose specified.
Second, the drill, B, drill-stock, A, with its conical grooved head, in combination with the rod, C, spring, c, and screw-nut, D, substantially as described.
Third, the rods or chains, E E, combined with the rod, C, its screw-nut, D, and the operating rod or bar, X, substantially as, and for the purpose set forth.
Fourth, the blocks, f f, and, f'', and the tube, d, constructed and operating in combination with the castings, G, and, H, substantially as described.
Fifth, The cutter, E, with a cutting edge of the shape substantially as shown and described.

51,807.—Lifting Jack.—Horace Culver, Richfield, Ohio:
I claim the combination and arrangement of the bed piece, A, standards, B, prop, D, lifting lever, C, and locking bar, E, substantially as shown and described.

[This invention consists in the combination of certain parts to constitute a lifting jack which shall be simple, cheap and durable and which can be regulated and used readily and with facility.]

51,808.—Carriage Wheel.—Andrew J. Curtis, Winterport, Maine:
I claim the combination and arrangement substantially as hereinbefore explained of one or more screw bolts, F, and the stud, I, with a wheel felly and tire or with the same and one or more socket pieces, E, arranged with respect to the felly substantially as hereinbefore specified.

51,809.—Annunciator.—M. L. Deering, New York City:
First, I claim the combination of the rachet wheel, d, provided with studs, g, radial arm, l, with its spring parol, m, connecting with its bell-wires, o o, and hammer-stem, s, for striking the bell, r, or its equivalent, arranged with regard to each other and operating when the bell-wires are pulled, substantially in the manner described, and for the purpose specified.
Second, In combination with the above, the connecting links, b b', of the wires, o o, with the spring-swinging arm, P, having one or more trips, h' P, for operating the hammer stems, m' n', and bell, A, or its equivalent, arranged so as to operate when the bell-wires, o o, are pulled substantially in the manner and for the purpose specified.

[The object of this invention is to obviate the use of a series of bells one for each room in the house or those with which the annunciator is connected, it consisting in a novel arrangement of parts whereby with the use of only two bells of different intonations, a great combination of sounds can be produced sufficient for indicating the numbers of a considerable many rooms, say from 1 to 50, without causing any confusion of sounds, which would prevent their being plainly understood or read, after the system of such sounds has been once explained.]

51,810.—Material for the Manufacture of Paper Pulp.—Anthoine de Gogorza, New York City:
I claim, as a new article of Manufacture, a pulp suitable for the manufacture of paper obtained from the fibre of the bark of the "Fourretia Platanifolia" of Humboldt, a tropical tree of the natural order of the "Malvaceæ." Whether used alone or in combination with other fiberous substances, in the manufacture of paper, substantially as above described.

51,811.—Farm Gate.—Levi S. Deming, Newington, Conn:
I claim the combination of the bar, h, weight, p, with the brakes, A, gates, k, substantially in the manner as and for the purpose described.

51,812.—Tobacco Pipe.—August T. Dietz, Philadelphia, Pa. Antedated Oct. 19, 1865:
I claim extending the stem of the pipe or of the elbow, D, through and opening its tube downward into the reservoir, as specified and described.

51,813.—Manufacture of Paper Pulp.—John W. Dixon, Philadelphia, Pa.:
I claim the process of treating wood, straw, cane, and, other analogous vegetable substances by highly heated water under pressure of 125 pounds and upward, substantially as herein set forth and described.

51,814.—Drill for Rock Boring.—Lorenzo Dow, New York City. Antedated Dec. 28, 1865:
I claim a ring or stock armed with sapphires, which are disposed in such a manner as to protect the stock while performing its legitimate function of boring or cutting, substantially as herein described.

51,815.—Converting a Rectilinear Motion into a Rotary Motion.—James B. Eads, St. Louis, Missouri:
I claim the converting of a rectilinear motion into a rotary one by the use of nuts, screw shaft and pawls or stops substantially as described.

51,816.—Coal Stove.—John Ekin, Xenia, Ohio:
First, I claim the combination of the inner cylinder, perpendicular bars and cone plate, substantially as described.
Second, I also claim the flange projecting downwardly from the base plate of the stove to form a means of attachment for the ash pan, substantially as described.

51,817.—Combined Plow and Scraper.—Richard Elliot, Plainfield, N. J.:
I claim the scraper composed of the bar, E, and bottom, F, applied to or combined with a plow, to operate substantially as and for the purpose set forth.
I further claim the bar, G, in combination with the plow, substantially as and for the purpose specified.

51,818.—Instrument for Drawing Railroad Spikes.—Josiah Ells, Pittsburgh, Pa. Antedated Dec. 26, 1865:
I claim the employment and use of a lever or draw bar having a bifurcated claw of curved form, in connection with a hook, or pair of hooks, for supporting a fulcrum, and so constructed as that the hooks will catch over the rail, and prevent the fulcrum of the lever or bar from slipping away during the operation of drawing the spike.

51,819.—Broom Head.—John U. Flester, Winchester, Ohio:
I claim the spike bar, C, constructed and operating substantially as described, in combination with the clamp, A, for the purposes specified.

51,820.—Beer Faucet.—Jos. Firmenich, Buffalo, N. Y.:
First, In combination with the spigot of a beer faucet, a central internal tube, c, closed, with the exception of one or more minute perforations at its lower extremity, and provided with a closely fitting valve, a, having a square shank, F, and thus serving the double purpose of opening and closing the spigot and of operating the plunger, and so constructed that, when the mouth of the spigot is inserted in the beer, the raising of the follower will cause the tube to fill by atmospheric pressure, in the manner and for the purpose herein set forth.

51,821.—Adjustable Cut-off Valve Gear.—Alexander W. Foster, Pittsburgh, Pa.:
First, I claim the drum, B, constructed as herein described, with a series of cams, 1 2 3 to 9 10, of gradually decreasing length, and made to shift on its axis by the action of the governor, to operate in combination with the valve, A, substantially as and for the purpose described.
Second, Providing the working faces of the cams, 1 2 3 to 10, with V-shaped grooves, to operate in combination with the V-shaped roller, a, on the valve spindle, substantially as and for the purpose set forth.

51,822.—Apparatus for Extracting Gold and Silver from Quartz, Etc.—Willard Monroe Fuller, Chicago, Ill.:
First, I claim the method herein described or introducing, in a diffused condition, powdered auriferous or argentiferous ores under a column of mercury or heated lead, so that the individual particles of gold or silver, on rising through the mass of mercury or lead, shall necessarily come in contact and infallibly form an amalgam or alloy therewith, substantially as set forth.
Second, I claim the method herein described of forcing crushed and powdered auriferous or argentiferous ores down and up and through a body of mercury or heated lead, for the purpose of forming an amalgam or alloy therewith, by atmospheric pressure, that is to say, by exhausting the air in the vessel containing the mercury or melted lead, substantially as herein set forth.
Third, I claim an apparatus or machine for extracting gold or silver from auriferous and argentiferous ores, the same consisting of the following elements in combination:—First, a closed amalgamating or alloying vessel, as described; second, a hopper and shoot or tube discharging ore at the bottom of the said vessel, as described; third, a device or machine for exhausting the air in said vessel, as described.
Fourth, I claim the employment, in combination with the amalgamating or alloying vessel as described, of an expanding or trumpet-shaped shoot or tube, for conveying the powdered ore to near the bottom of the said vessel, in a diffused state, substantially as herein set forth.

51,823.—System for Libraries.—J. M. W. Geist, Lancaster, Pa.:
First, I claim the arrangement of Sunday-school libraries into uniform divisions, numerically corresponding with the classes of the school, in combination with the figures on the fixed margin of the index, and the folios of the catalogue, substantially in the manner and for the purpose specified.
Second, The employment of the index, with its revolving disk, for the designation of classes and divisions, substantially as shown, for the purpose specified.
Third, The arrangement of the catalogue into uniform divisions (with uniform intervening blanks, consecutively numbered), corresponding with the divisions of the library and the classes in the school; also the application of the catalogue as a teacher's class book, substantially in the manner specified.
Fourth, The construction and use of the index box and its sliding lid, with its slate surface or equivalent, and declamation or classes, as a register, substantially as shown and for the purpose specified.
Fifth, I claim the peculiar method of securing library tags by the use of isinglass and tannic acid, independently applied, in the manner and for the purpose specified.
Sixth, I also claim the combination and use of the index, index box and register, catalogue and tags, as a system, arranged and operating substantially as and for the purpose fully set forth and shown in the foregoing specification.

51,824.—Farm Gate.—Luther Gibbs and Hiram M. Shaw, Fremont, Ohio:
I claim a sliding gate consisting of the bars, B, which slide between the boards of the adjoining panel and fit snugly into the intervening space, the frame, K, with its roller, the brace, C, and cords, D, all constructed and combined substantially as and for the purposes set forth.

51,825.—Hand Corn Planter.—Calvin L. Green, Johnson's Creek, N. Y.:
First, I claim the employment or use of the jointed handle, C and D, in hand corn planters, in combination with the delivery slide, B.
Second, the hinging locking clamp, E, constructed, arranged, and operating substantially in the manner and for the purpose shown and described.
Third, The combination of the seed box, A, with the jointed hoe handle, in hand planters, for the purpose set forth.

51,826.—Wood-bending Machine.—John Willis Griffiths, Brooklyn, N. Y.:
First, I claim the machine for bending timbers, herein described, constructed and operating substantially as herein set forth.
Second, The jointed mold with adjustable holders, constructed substantially as herein shown and described.
Third, The joint mold with adjustable holders, in combination with the revolving disk and compresser, substantially as described.
Fourth, The combination of the hydraulic press thrusting head, O, and vertical shaft, E E, as and for the purpose described.
Fifth, the double head clamp, L, in combination with the joint mold and adjustable holders.

51,827.—Wood Bending.—John Willis Griffiths, Brooklyn, N. Y.:
I claim the method of preparing beveled ship timber for bending to forms required, by sawing bevelling slabs or boards from the sides of the timber, but not entirely severing the same therefrom, substantially as shown and described.

51,828.—Evaporator.—Francis M. Harris, Winnamac, Ind.:
First, I claim the arrangement of the pans upon the furnace in an inclined position, in combination with the scum spout at the forward end, as herein shown and described.
Second, The formation, in pans for concentrating saccharine liquors, of a water chamber for the formation of steam and for conveying the same in the form of jets under the pans, substantially as and for the purpose set forth.

51,829.—Railway Snow Plow.—C. L. Heywood, Boston, Mass.:
First, I claim the use of a scraper fitting over the rails, and susceptible of both a vertical and lateral play, by means of devices arranged and operating substantially as hereinabove described.
Second, I claim operating the wings, x x, by means of the arrangement of devices described, so that they can be set and held at any desired angle with the carriage, as set forth.
Third, The combination of the hand lever, u u, cam, v v, and lever arm, l l, for elevating and disengaging the scraper from the rails, as described.
Fourth, Having the scraper so as to incline toward the wheels, and attached to an arm, k k, which has an elastic bearing, as described and for the purpose specified.

51,830.—Manufacture of Floor Cloth.—James B. Hodgkin, New York City:
I claim as a new article of manufacture the paper described, when prepared as hereinbefore set forth.

51,831.—Adjustable Packings for Pumps.—Cornelius Hood, Seneca Falls, N. Y.:
First, I claim the adjustable gage, E C, substantially as constructed and applied.
Second, A set screw or equivalent detainer, in combination therewith.

51,832.—Manufacture of Floor Cloth.—George F. Hopper, New York City:
I claim the manufacture of floor cloth or paper, by successively saturating the printed paper with oil, covering it on both sides with a solution or India-rubber and varnishing the face side, substantially as described.
I also claim the floor cloth or paper manufactured as above described as a new article of manufacture.

51,833.—Artificial Fuel.—Samuel D. Hovey, Chicago, Ill.:
I claim a new combination of an artificial fuel, as herein described.

51,834.—Photographic Sensitizing Box.—Wm. Hudson, Jr., and Augustus L. Hudson, Hingham, Mass.:
We claim, First, The within-described method of sensitizing a plate by placing the same on dippers, immersing it in the sensitizing solution, and securing it in the shield—all these operations being effected by mechanism substantially such as herein specified, or any equivalent thereof.
Second, The dippers, F, applied to a rocking head, E, in combination with the intermittently oscillating sleeve, B, cam groove, h and shield, N, all constructed and operating substantially as and for the purpose described.
Third, The oscillating lever, M, and latch, s, in combination with oscillating arms, D, toothed rack, q, pinion, p, and hinged cover, L, constructed and operating substantially as and for the purpose set forth.
Fourth, Providing the cistern, with a self-operating cover, substantially as and for the purpose specified.
Fifth, Raising the cistern containing the sensitizing liquid against the plate to be sensitized, instead of dipping the plate into the liquid, by means substantially such as herein described, or any equivalent means.
Sixth, The spring pad, K, applied in combination with the dippers, F, and shield, N, substantially as and for the purpose described.
Seventh, The spring catches, b2, in the shield, in combination with buttons, i2, constructed and operating substantially as and for the purpose described.
Eighth, The levers, i2 m2 o2 p2, and connecting rod, q2, applied in combination with the spring catches, b2, in the shield, substantially as and for the purpose set forth.
Ninth, The spring, s2, in combination with the notch, r2, in the rod, q2, and with levers, o2 p2 i2 m2, and spring catches, n2, in the shield, all constructed and operating substantially as and for the purpose described.
Tenth, The set screw, t2, in the spring dog, s2, applied in combination with the handle, C, as described, so that the moment when the spring catches, b2, are sprung, can be regulated.

51,835.—Lamp-chimney Cleaner.—Ferdinand Imhorst, New York City:
I claim the yielding self-adjusting pad, d, in combination with the short jaw, b, of the cleaner, A, constructed and operating substantially as, and for the purpose set forth.
Also a lamp-chimney cleaner, made as described, as a new article of manufacture.

[This invention relates to a lamp-chimney cleaner which is composed of two hinged jaws; one of these jaws is longer than the other, and provided with a stationary winged pad, whereas the pad attached to the other short jaw is movable and yielding, so that the cleaner is enabled to accommodate itself to the shape of the bulb of a lamp chimney.]

51,836.—Revolving Fire-arm.—Benj. F. Joslyn, Stonington, Conn. Antedated Dec. 26, 1865:
First, Connecting the frame and barrel of a revolver together by means of a center pin, B, secured to the frame and having one or more projections, a, adapted to a groove, b, and to one or more inclined recesses, c, of the barrel, all substantially as and for the purpose herein set forth.
Second, The combination of the barrel, its spring block, G, and pin, h, with the projection, f, of the frame and its recess, i.

51,837.—Breech-loading Fire-arm.—Benj. F. Joslyn, Stonington, Conn.:
First, The combination of the breech piece, D, and its tubular projection, d, with a cylindrical barrel capable of sliding and being turned in the said projection, all substantially as and for the purpose herein set forth.
Second, The combination of the said cylindrical barrel, tubular projection, d, of the breech piece, and spring catch, G, the whole being arranged and operating substantially as set forth.

51,838.—Gate Fastening.—John C. Kellogg, Thorntown, Ill.:
I claim the gate-fastening herein described, when constructed, arranged, and operated substantially as set forth.

51,839.—Egg Beater.—Francis L. King, Worcester, Mass.:
I claim the application and use of the flattened and sharp-edged elastic steel wire, for the purpose of beating up eggs or cutting up eggs, as specified.

51,840.—Washing Machine.—Daniel Lampson, Beaver Dam, Wis.:
I claim applying the interposed spacing blocks, b b, to the slats, a a, in such manner as to form covers for the heads of the nails which are employed for securing said blocks and slats in place, substantially as described.

51,841.—Apparatus for Carbureting Air.—Charles B. Lovelace, Syracuse, N. Y.:
First, I claim the small or supplemental gas meters, in combination with the tank, A, and air-holder, B, when operating substantially as and for the purposes described.
Second, The separate or combined construction and arrangement of the chambers, C D and F, substantially as described.
Third, Conducting the air, as it becomes gas, through pipes, G J d' and e, into the gas chamber.
Fourth, The arrangement, substantially as described, of the stop-cocks, f, g and h.
Fifth, The stove, K, as described, in combination with the air-mixing chamber, M, and pot stands, L.

51,842.—Apparatus for Drawing Pipes from Wells.—Thomas Lowry, Pittsburgh, Pa.:
I claim the employment and use of expanding wedges or rawls, or their mechanical equivalents, operated by a draw rod, in the manner described, for the purposes of drawing pipes from oil wells, as hereinbefore stated.

51,843.—Distilling Petroleum and other Substances.—Orazio Lugo, New York City:

I claim the improvement in distillation above described and for the purposes specified.

51,844.—Stopper for Fruit Jars.—Wm. W. Lyman, West Meriden, Conn.:

I claim a glass stopper, A, for fruit jars, constructed with a thumb piece, c, notches, d, recess, a, ring, b, depress top and bottom, as described.

51,845.—Pencil Sharpener.—John MacMullen, New York City:

First, I claim the isolation as well as the convenient form and arrangement of the file and its combination with the dirt box, as in No. 1.

Second, The combination of the knife blade or cutter with the chip box, as in figure No. 2, so that the sharpening of pencils or crayons may not cause any dirt on the table or other place where it may be used.

Third, The combination of the dirt box with both the file and the cutter, as in figure No. 3, for very often a different angle is required for the wood from that required for the marking material, and this combination secures both of these, together with the advantages of the dirt box.

Fourth, I claim also the modification of making the boxes somewhat higher at the ends, so that books or papers may be laid upon the pencil sharpener without receiving any soil from the filings that may remain upon the file.

51,846.—Colored India-rubber gutta-percha Compound.—James Malcolm, New York City:

First, I claim combining with india-rubber or other vulcanizable gum and sulphur, a pigment prepared in the manner herein described, and I claim this combination whether the said compound or sulphur, gum and pigment be or be not mixed with the other ingredients, as set forth.

Second, The method of producing colored vulcanized india-rubber or such other gum, by combining with the gum [sulphur and a pigment, prepared as described, and by subjecting such compound to vulcanizing heat, as set forth.

Third, The method of producing colored vulcanized india-rubber or such other gum, by combining with the gum, sulphur and a pigment, prepared as described, and by subjecting such compound to vulcanizing heat and by exposing the vulcanized compound to solar rays, whether immersed or not in alcohol.

51,847.—Manufacture of Colored India-rubber Compounds.—James Malcolm, New York City:

I claim the method herein described of coloring or dyeing vulcanized india-rubber or other vulcanized gum.

51,848.—Manufacture of Colored India-rubber and Gutta-percha Compounds.—James Malcolm, New York City:

I claim vulcanized india-rubber, or other vulcanized gum, colored or dyed, substantially as herein set forth.

51,849.—Manufacture of Colored India-rubber and Gutta-percha Compounds.—James Malcolm, New York City:

First, I claim the plastic compound herein described, the same consisting of india-rubber or other vulcanizable gum, sulphur and a pigment prepared as herein set forth, and this is claimed whether the said composition contains other ingredients or not.

Second, As a new manufacture I claim colored vulcanized gum when composed of india-rubber or other vulcanizable gums, sulphur and a pigment such as herein described, and when incorporated, subjected to vulcanizing best, and this is claimed whether the said compound contains other ingredients or not.

51,850.—Railroad Plow.—Charles Medbury and Thomas Wyatt, Providence, R. I.:

First, We claim mounting the plow in such a manner that it will adapt itself, in respect to its position and elevation, to the loaded state of the car.

Second, The combination and arrangement of the spring with the plow, to operate substantially as described, for the purposes specified.

Third, We claim controlling the operation of the plow, by means of a crank shaft, and suitable connections, substantially as described.

51,851.—Sawing Machine.—William Melville, of Detroit, Mich.:

I claim the arrangement of the stationary frame, a, swinging frame, d d', saws, c c, arms or links, u, frame, o, bar, p, weight, t, and supports, d d, as and for the purpose set forth.

[This invention relates more particularly to the hanging of saws to be operated by hand, and especially adapted for family use, and consists in hanging the saw in such a manner, within a suitable supporting frame, that it can be operated with facility, ease, and with but little labor compared to the ordinary way now practiced for sawing woods.]

51,852.—Lamp.—George W. Mitchell, St. Louis, Mo.:

First, I claim a lamp in which the oil is conveyed directly from the lamp reservoir to the flame, without the employment of a wick.

Second, I claim regulating the flow of oil to the lamp burner by a device located within the reservoirs, substantially as described, so as to prevent leakage.

Third, I claim the diminishing grove, e, in the plug, E, in combination with the aperature, a, for regulating the flow of oil to the conducting tube, F.

Fourth, I claim the burner herein described, the same consisting of the external cup, G, and internal deflector, G, so arranged as to leave an intervening space, g, as and for the objects specified.

Fifth, I claim the combination with the burner, G G, of the perforated tubes, H H, arranged and employed substantially in the manner and for the purpose set forth.

Sixth, I claim making the reservoir, A, with a reflecting surface, Ae, substantially as described.

51,853.—Carpet Stretcher.—George Mosman, Chicopee, Mass.:

I claim the holders, c, springs, a, or their equivalents, in combination with the plate, k, substantially as and for the purposes described.

51,854.—Draining Pump.—William J. S. Nelson, St. Louis, Mo.:

First, I claim surrounding the vanes, F, with a ring, E, which connects their ends, and which ring is interposed between them and the side of the cylinder of the pump, substantially as and for the purpose above described.

Second, I also claim the combination upon the same hub or hollow cylinder, C, of the spiral vanes, F, and the straight vanes, B, in manner substantially as described.

Third, I also claim reducing the part, A', of the outer cylinder in which the straight vanes revolve so that its sides become narrower as they approach the end of the cylinder, substantially as shown.

Fourth, I also claim in combination, the fixed outer cylinder, A, with its reduced end, A', the vanes B, and F, arranged so as to be combinations of each other, and the fixed radial blades, H, substantially as shown.

51,855.—Extension Table.—F. R. Osgood, Roxbury, Mass.:

I claim in extension tables, having auxiliary leaves, making or hinging said leaves so as to fold together under a leaf or leaves, hinged to the frame of the table when it is closed up, substantially as described.

Also, the employment of the connecting and supporting hinges, g, having surfaces for the support of the auxiliary leaves at a distance above the main frame, equal to the thickness of the folded or auxiliary leaves.

Also the pockets, h, made in the center frames, b, for receiving the hinges, g, substantially as set forth.

51,856.—Bed Bottom.—Henry H. Palmer, Rockford, Ill. Antedated Dec. 28, 1865:

First, I claim the upper frame work of slats composed of two sets of slats connected together at the center, or at their inner ends, or at any point between their center and either end, by means of a hinge or joint, substantially as set forth.

Second, The compound joint composed partly of metallic and partly of flexible material, substantially as described.

Third, The flexible braces, D E, with the flexible straps, B, in connection with the slotted frames and the rigid lower frames, A A, with the straps, c, attached to the former for the purpose specified.

Fourth, The combination of the upper slatted frames with the lower rigid ones and the springs attached to both, all constructed and arranged substantially as set forth.

[The object of this invention is to obtain a slatted spring bottom which, while being elastic, or yielding equally to, as others now made, will retain its shape however long in use. The ordinary slatted spring bed bottoms soon have their slats spring so that they assume a permanent hollow form, and when the bed is made up it is uncomfortable to occupy. This difficulty, it is believed, is fully obviated by this improvement.]

51,857.—Manufacture of Sand Paper.—J. Palmer, Cleveland, Ohio:

I claim sand flint or emery paper, saturated with boiled linseed oil or other quick drying fatty substance, as a new article of manufacture.

[This invention consists in the application to common sand flint or emery paper, of boiled linseed oil or other equivalent fatty substance in such a manner that, after the paper has absorbed the oil, and said oil has become thoroughly dry and fixed in the pores of the paper, an article is obtained of much greater toughness and firmness than sand paper made in the usual manner, and this sand flint or emery paper is more durable and economical than any other similar article.]

51,858.—Hydro-pneumatic Telegraphs for Hotel Annunciators.—Geo. G. Percival, M. D., Brooklyn, N. Y.

I claim the combination of the chambers, I P, fluid tubes O O', indices, Q Q', connecting air pipes, H, and means for injection retention and escape for the contained air, substantially as described.

51,859.—Ditching Machine.—William M. Perkins, Lafontaine, Ind.:

First, I claim the combination of the double coulter, consisting of the cutters, H H, with the screw and nut, I K.

Second, The adjustable mold board, M, adapted to act upon the raised mold at different depths of the share as described.

Third, The truck O O F R, in combination with and drawn behind the plow, and operating as and for the purpose described.

51,860.—Kite.—Thomas Perrins, Philadelphia, Pa.:

I claim a kite, the frame of which is formed on two or more pieces, constructed, combined and arranged, with respect to each other, and the cover of the kite, substantially as described and for the purpose set forth.

[This invention relates to an improvement in the construction of the frames of kites, by which a light, strong and convenient frame is produced, and which at the same time allows the kites to be packed for market in a very small compass.]

51,861.—Carriage Jack.—J. C. Plumer, Boston, Mass.:

I claim the use of the toggle, in conjunction with a lever with sliding fulcrum, for the purpose specified.

51,862.—Clothes Wringer.—Joseph F. Pond, Cleveland Ohio:

First, I claim the application of canvas cloth, or other material for lining, covering and protecting the inner surface of india-rubber clothes-wringer rollers, and to serve as a fastening to secure the rolls to the shaft, substantially as herein described.

Second, I claim the cam lever, D, with its bearing l, operating in the slot, K, of the spring lever, C, for the purposes herein set set forth.

51,863.—Table Stand for Articles of Food.—Benjamin F. Porter and H. M. Gilnes, Manchester, N. H.

We claim the table-stand, provided with a series of shelves, and either with or without an open wire netting or casing, substantially as described, and for the reception of articles of diet as specified.

51,864.—Alphabeticon.—G. H. R. Reffelt, Hoboken, N. J.:

I claim the combination of the single disk, C, having characters on both sides and made for two languages, the lettered sides, b, and perforated boards, B, all constructed and arranged to operate as and for the purposes specified.

51,865.—Apparatus for Filling Molds for Hard Rubber.—Jacob C. Robie, Binghamton, N. Y.:

First, I claim the peculiar construction of the cylinder, Fig. 4, with the screw plug or plunger, Fig. 3, and the mode of attaching the cylinder to the flask, Fig. 2, as herein described for the purpose set forth.

Second, I claim the openings through the cover and top of the flask, for the purpose herein described.

Third, I claim the slide stopper, Fig. 5, letter, S.

Fourth, I claim retaining the material to be vulcanized in a condensed state during the process of vulcanization for the purpose set forth.

Fifth, I claim the combination of the cylinder, Fig. 4 screw plug, Fig. 3, wrenches, R, and E, Fig. 1, flask with vent openings, D D C, in its cover and slide stopper, S, constructed substantially as herein described for the purpose set forth.

51,866.—Bed Bottom.—Wm. W. Robinson, Ripon, Wis.:

First, I claim the construction, arrangement and combination of the two part spring cases or boxes, and springs, C C', with the spring, slat, B, and tie rod or brace, E, of a spring bed bottom, substantially as and for the purposes set forth.

Second, The rubber spring, C, in combination with the two part case or box, A D, constructed and operating as described, the same being an attachment for a braced spring slat of a spring bed bottom, as set forth.

Third, The screw plates, F, with a grooved portion, c, in combination with the spring slat, D, the part boxes, A D, springs C C', substantially as and for the purposes set forth.

51,867.—Cement for Stone.—Henry Schneider, Cleveland, Ohio:

I claim the cement herein set forth when compounded and composed of the ingredients described.

51,868.—Remedy for Sore Eyes.—Augusta Schuster, St. Louis, Mo.:

I claim a remedy for sore eyes, or inflamed eyes, composed of the ingredients herein mentioned, as and in the proportions specified or their chemical equivalents.

51,869.—Sheep Rack.—Henry Seevers, Perry Township, Ohio:

I claim the sliding rack and the grain trough, so hinged and arranged as to allow the sheep to feed upon either grain or hay, and stand upon the same ground without having trough or rack at any time to interfere with each other, and so easily moved to one side when the box is to be filled with hay.

51,870.—Apparatus for Tanning.—Thomas Sharp, Nashville, Tenn.:

First, I claim the use, in a reservoir or vessel containing the tanning liquor employed, either one or more false vats or chambers, provided with one or more valves in the lower and upper portions thereof, and so arranged or hung within the reservoir as to be susceptible of an oscillating motion in a vertical plane, substantially in the manner described and for the purpose specified.

Second, In the graduated index, S, arranged as and for the purpose specified.

51,871.—Sieve.—Thomas M. Sheppard, Chicago, Ill.:

I claim in combination with a sieve, A B, the employment of the roller, G, the scraper, H, shaft, E, and crank, F, all arranged and operating as and for the purposes herein specified and shown.

51,872.—Machine for Upsetting Wagon Tire.—Elias Shopbell, Ashland, Ohio:

I claim the construction and arrangement of the herein described serrated cam levers, E F, serrated cogged and concave slide, D, serrated stationary block, B, and the cogged segmental lever, H, when combined and susceptible, substantially as described.

Second, In combination with the above, I claim the arrangement of the punching die, L, and standard, I, for the purpose set forth.

51,873.—Churn.—F. Shurr and John Palmer, Milwaukee, Wis.:

I claim, First, The air duct or tube, C, arranged within the churn and opening at the bottom thereof, substantially as described.

Second, The valve, a, arranged upon the air duct, C, and within the hollow dasher rod, E, substantially as described.

Third, The combination of the churn, A, air duct or tube, C, dasher, D, hollow dasher rod, M, and valve, a, arranged substantially as herein shown and described.

51,874.—Bit Stock.—Aaron W. Smith, Manchester, N. H. Antedated Dec. 26, 1865:

First, I claim the construction of the bow of a bit stock, substantially as described, so as to allow of its being taken apart for the purpose of adding thereto a revolving hand piece.

Second, The steel plug, S, and its corresponding steel thimble, O', constructed substantially as described, for the purpose of giving durability and steadiness to the revolution of head, C.

51,875.—Gang Plow.—H. C. Smith, Ridge Farm, Ill. Antedated Dec. 28, 1865:

First, I claim the connecting of the plow beams, A A, to the axle, C, by means of the king bolt, D, strap, E, and plates, F F', all constructed, combined, and arranged in the manner and for the purpose herein set forth.

Second, The plow beams, A A, attached to the axle, C, as shown, in combination with the frame, H, the latter being connected at its front end to the plow beams by the rod, b, and its rear end supported by the castor, I, the above parts being used in connection with the cord or chain, e, pulley, f, lever, J, and the strap, K, or its equivalent, for the purpose specified.

51,876.—Petroleum Burner for Cooking Purposes.—W. H. Smith, New York City:

First, I claim the flame chamber or vapor generator, C, surrounded by the annular oil chamber, D, which passes quite around the flame. This form I prefer, but it may pass around only one half thereof.

Second, The tubes, F and G, or their equivalents, one within the other, with an air space between them, and with their foraminous lower ends for the admission of air, with the deflector, H, on the top of the tube, E, and the deflector, I, on the top of the flame chamber, C, substantially as and for the purpose set forth.

Third, The flame chamber, C, in combination with the oil chamber and deflectors aforesaid, for the purposes described.

Fourth, I claim the burner in all its parts, constructed and arranged as represented and described, for the use and purposes herein set forth.

51,877.—Printers' Galley.—Jasper Snyder, Burlington, Iowa:

I claim the movable sliding block composed of guide bars, c, set screw, e, slatted stock, d, and adjustable tail piece, f, in combination with a galley, A, constructed and operating substantially as and for the purpose set forth.

51,878.—Shoe Lacing.—Leonard A. Sprague, New York City:

First, I claim the lacing eyelet, constructed substantially as herein described, combining in one continuous piece, and without the employment of solder, the loop or eyelet proper, the washer, and clinching rivet or pin, all as heremebefore set forth.

Second, The method of fastening the lacing eyelet, as herein described, on to the material to be laced, by piercing the said material and clinching it at one operation, as set forth.

51,879.—Thiefs and Tests for Liquids.—Nelson Stafford, Brooklyn, N. Y.:

First, I claim a thief tube formed with an opening, as set forth, in combination with a hydrometer or gage, as and for the purposes set forth.

Second, I claim the combination of a thermometer, a hydrometer or gage, and a thief tube, substantially as set forth.

Third, I claim the combination of a thief tube, test glass, thermometer, and hydrometer, substantially as set forth.

51,880.—Grain Dryer.—R. T. Sutton, Rochester, N. Y.:

I claim the said conveyers and metallic floors, in combination with the fan, F, valves, c and v, and the ventilators, a, as and for the purposes set forth.

51,881.—Flour Sifter.—Howard Tilden, Boston, Mass.:

First, I claim grooving the rollers roundways, so that coarse pieces of foreign matter will slip into the grooves without being crushed between the rollers and the screen.

Second, I claim the rollers grooved roundways, in combination with the inclined scrapers.

51,882.—Bed Bottom.—Asa M. Tomb, Lyons, N. Y.:

First, I claim the metallic caps, B, on the end of the slat, C, with the aperture or opening, a, in the end of the caps, to receive the rubber, substantially in the manner described.

Second, The hooked-headed screws, E, with the holes, f, in the heads thereof, and the wire or iron staples, D, as used in combination with the same, substantially in the manner as herein described.

51,883.—Dies for the Manufacture of Sheet-metal Ware.—Morris Wells, Brooklyn, N. Y.:

I claim the process hereinbefore described of forming seamless hollow ware by striking up the article in a series of dies of successively increasing depth and decreasing diameter, in the manner specified.

51,884.—Machine for Fulling and Finishing Felted Cloth.—Milton D. Whipple, Cambridge, Mass.:

I claim the mode of fulling or contracting felted cloth, by raising, depressing, or bending the fabric while it is held in a close or loose condition—this effect being produced by means of fluted rollers and a beater, or their equivalents.

I also claim a series of pairs of rollers in which the surface velocity of each pair that receives the cloth is less than that of the pair which delivers it, substantially as specified.

In combination with two or more pairs of rollers and a beater, arranged as herein described, I claim the attached wash-box and the drying apparatus, substantially as herein described and for the purpose specified.

51,885.—Steam Engine.—George B. Whiting, Washington, D. C.:

First, I claim arranging the induction and eduction valve of a reciprocating steam engine, so as to work within and through the piston, substantially as described.

Second, The fixed central cylinder trunk, A, with steam ports and passages, as described.

Third, I claim, in combination with the fixed central cylinder trunk, A, the piston valve, C, steam chamber, E, vacuum chamber, F, and annular piston, E K, substantially as described.

51,886.—Valve Gear.—George B. Whiting, Washington, D. C.:

First, I claim the intermediate twin gears, I I' m m' n n' o o', either one or more of them, in combination with the pinions, p q, internal gears, J k, and disk, g, substantially as described.

Second, The wrist pin, d, or its equivalent, and yoke, E, in combination with the disk, g, intermediate twin gears, I I' m m' n n' o o' either one or more of them, internal gears, J k, and pinions, p q, substantially as described.

51,887.—Bobbin for Spinning, Etc.—Benjamin Wilbur, Scituate, R. I.:

I claim the use of metallic springs, as constructed and inserted and secured in the bobbin head, as above shown and described.

51,888.—Clothes Wringer.—David F. Williams, Cumberland, R. I.:

First, I claim the arrangement and combination of the cross bar, G, and blocks thereon, with the screws, H, slots, F, and false standards, B, constructed and operated substantially as described.

Second, The cog wheels, J K and L, the crank, m, and arm, n, constructed and operated substantially as set forth.

51,889.—Combination of Lenses for Photographic Purposes.—Joseph Zentmayer, Philadelphia, Pa.:

First, I claim a doublet made of uncorrected meniscus lenses of different spherical curvatures, arranged concentrically, or nearly so, substantially in the manner and for the purpose specified.

Second, I claim the arrangement of a series of uncorrected meniscus lenses of different spherical exteriors, any two of which series, when set concentrically, form a corrected, or nearly corrected, doublet, substantially in the manner as specified.

51,890.—Sewing Machine.—E. E. Bean, Abington, Mass., assignor to himself and Jacob Chickering:

First, I claim in sewing machines, in which the feed is effected by

an eye-pointed needle, a support or brace for the needle, which slides vertically, and whose lateral movement coincides with that of the needle, substantially as described.

Second, I claim the bar, D, sliding in and vibrating with the needle-bar, and employed in combination with the hanging bar, e, or its equivalent, and eye-pointed needle, in the manner and for the purpose explained.

[The oject of this invention is to guide and support the needles of sewing machines during their descent into the cloth, and also to support the needles or awls, of needle or awl-feeding machines, while the feed is taking place. The invention is applicable to all descriptions of sewing machines operating with vertically-moving needles, or with those which move in curved paths.]

51,891.—Machine for Oiling Wool, Etc.—Thomas A. Campbell (assignor to himself and C. L. Goddard), New York City:

First, I claim the case, A, and tube, G, arranged as herein shown, to convey a gradual supply of oil to the rotary brush, E, without the aid of rollers, and to prevent the scattering and waste of the oil.

Second, Making the case, A, adjustable on the bearers, B, substantially as and for the purpose described.

51,892.—Cotton Gin.—J. E. Carver, Bridgewater, Mass., assignor to himself, Chas. Gordon, East Bridgewater, Mass., and John Pierce, Boston, Mass.:

I claim the combined beater and fan, composed of the drum, B, provided with wings, c, in combination with the spirally-grooved roller, C, smooth roller, D, and the case, A, substantially as and for the purpose herein set forth.

[This invention relates to a new and improved roller gin for ginning cotton, and it consists in the employment or use of a spirally-grooved metal roller, in connection with a roller of wood, or other suitable material, and a beater and fan.]

51,893.—Garden Hoe.—Daniel E. Eaton (assignor to himself and Joseph W. Fowle), Boston, Mass.:

I claim the combination of the two series of teeth, arranged to operate substantially as set forth.

51,894.—Varnish for Painting.—Andreas Elgner, Augsburg, Bavaria, assignor to Sampson R. Urbino, Roxbury, Mass.:

I claim the composition, made of the ingredients, and in the manner and for the purpose substantially as hereinbefore described.

51,895.—Drawing Roller for Spinning Hemp, Flax, Etc.—Henry Hall, Lambertville, N. J., assignor to himself and Thomas Finley, Isaac Schlichter, and Thomas Hall, Philadelphia, Pa.:

I claim a drawing roller, composed of annularly-arranged segments of wood, with its grain in the direction described, and confined between plates, all substantially as and for the purpose herein set forth.

51,896.—Sawing Staves.—Calvin J. Holman, Oshkosh, Wis., assignor to Sparrow M. Nickerson, Chicago, Ill.:

I claim the arrangement in one machine of the carriage, I, saw, B, endless carriage, E, roller, S, and planer, T, arranged and operating substantially as and for the purposes herein set forth.

51,897.—Spike.—Lancelot Kirkup (assignor to himself, Francis D. Taylor and Charles A. Scott), Brooklyn, N. Y.:

I claim a split spike, so constructed that the two halves or prongs will diverge or turn outward, on being driven into the wood, in planes parallel with the split in the spike, substantially as described.

51,898.—Apparatus for Printing Oil Cloth.—John Marchbank, Lansingburgh, N. Y., assignor to himself and Joseph M. P. Price, Philadelphia, Pa.:

I claim, First, Constructing forms of convertible type for printing in more than one color, so that the portions of the type intended to receive a particular color may be successively advanced to receive the color, and retracted to their places in the form, so that all the colors may be printed from one impression, substantially as described.

Second, The combination of the case, A, and type, B, substantially as and for the purpose described.

Third, The combination of the type, B, cross levers, C, and bars, D, substantially as and for the purpose described.

51,899.—Pruning Hook.—Wm. S. McLean (assignor to himself and Volney Stockton), Williamsburgh, Ohio:

I claim the arrangement of rods, A B, tenon and grooves, a a' b b', double knife-edged hook, C C', and chisel, D, adapted to act by percussion, in the manner set forth.

51,900.—Machine for Washing Wool and other Fibrous Material.—William Murkland, Lowell, Mass., assignor to himself, Chas. G. Sargent, Grantville, Mass., and Moses A. Johnson, Lowell, Mass.:

I claim, in a machine for the washing of wool or other fibrous material, the combination of the toothed cylinder with a revolving and traversing worm, and with a worm gear, so that said worm will act as a reversing and traversing gear and the parts connected with it both an oscillating and a progressive motion, substantially as and for the purpose described.

I also claim an adjustable crank or its equivalent, in combination with the worm rack for the purpose of increasing or diminishing the oscillations of the picking and washing cylinder, substantially as described.

I also claim the combination of the toothed and fluted feed rod, the toothed shell or comb, and the oscillating cylinder for feeding the material to be washed to the tank, substantially as described.

I also claim in combination with the oscillating cylinder the cleaners, K, passing under and around said cylinder substantially as and for the purpose described.

I also claim the combination of the endless open belt with the toothed cylinder, E, and passing around said cylinder for the purpose of taking up, receiving, and delivering the washed wool to the squeeze rolls, or to any other point of delivery, substantially as described.

51,901.—Flour Sifter.—Daniel F. Robinson (assignor to self and Howard Tilden), Boston, Mass:

I claim the combination of the scoop its vibrating sieve, and the double series of transverse bars arranged with reference to each other, substantially as herein described.

51,902.—Rock Drill.—Peter Sweeney, New York City, assignor to John J. Flannagan, Jersey City, N. J., and Josiah Oakes, New York City:

I claim First, A drill composed of a number of scolloped wheels, arranged in a common head, substantially as and for the purpose set forth.

Second, Placing two or more of the cutting wheels in oblique positions toward their axles, substantially as and for the purpose set forth.

Third, The combination and arrangement of the screw spindle, B B', cross head, G, bevel cog wheels, d d' g g', and loose pulley, c c', when employed in connection with drill rod, H, in the manner and for the purpose explained.

Fourth, The worm, h, mounted on the adjustable shaft, i, in combination with the worm wheel, f, and screw spindles, E E', cross-head, G, and drill rod, H, constructed and operating substantially as and for the purpose described.

51,903.—Molders' Clamp.—Charles Truesdale (assignor to himself and William Resor & Co.), Cincinnati, Ohio:

I claim First, The construction of the jaws, A and B, substantially as described and their adaptation to slide upon each other and to be drawn and locked together by the action of a cam-headed lever, H I, or its equivalent.

Second, In the described combination with the sliding jaws, A and B, and cam-headed lever, H I, and shoulder, J, or their equivalents, the combination of the perforated bar, G G, and adapting a single clamp to a variety of sizes as explained.

51,904.—Construction of Railways.—William Peet and Marian L. Hyde, Brooklyn, N. Y., administrators of the estate of James T. Hyde:

We claim the combination of the iron cross tie with the wooden sleepers when constructed and arranged substantially as described.

51,905.—Electro Ballistic Chronographs.—Paul Le Boulenge, Antwerp, Belgium, assignor to Fritz Meert, New York City:

First, I claim the use of a body falling free and without friction for the measure of time, substantially in the manner herein set forth.

Second, The arrangement of files and circuits to obtain a simultaneous interpretation without mechanical aid, as set forth.

Third, Regulating the action of the electro magnets on their armature by means of inverse circuits and by the substitution of steel for soft iron (fer doux), as set forth.

51,906.—Stereoscopic Apparatus.—Henry Swan, No. 40, Charing Cross, Middlesex, Eng.:

I claim the combination of stereoscopic pctures, prisms and frames with reflectors, substantially as herein described.

51,907.—Winding Sewing-thread upon Spools.—William Weild, Manchester, Great Britain. Patented in England, Jan. 22, 1865:

First, The machine as a whole, composed of the elements combined arranged and operating substantially as set forth,

Second, The brake, b 7, in combination with the devices herein described or the equivalent to the same, for causing the belt changing shaft, e 3, to stop the winding part of the machine when the bobbins are sufficiently full.

Third, The combination of the shaper, g', with the oscillating parts, f 6, and, f 9, the whole operating substantially as and for the purpose set forth.

Fourth, The combination of the shaper or its equivalent with the cam, g 2.

Fifth, The combination of the traverse rod, f 5, with the inclines, h 2, and the shaper or its equivalent.

Sixth, The brake, d 8, and the devices described or the equivalent to the same for stopping the motion of the cam shaft.

Seventh, The lever, g 6, in combination with a screw, g 2, by which the adjustment of the lever's fulcrum is effected.

Eighth, The point, r 8, or its equivalent so operated as to prevent the uncording of the thread from a given point, and to assist in guiding the thread when pulled into the incision made in the edge of the spool or bobbin.

Ninth, The combination of the spring point, r 8, and the incision knife, r 7, upon the same arm.

Tenth, The hook, s 6, or its equivalent, operated substantially as set forth, for drawing the thread into the incision and serving the same.

Eleventh, The mode herein described of securing the thread between the collar on the spindle, k 2, and the end of the bobbin so that it will wind thereon.

Twelfth, The combination of the point, r 8, incision knife, r 7, hook, s 6, spring, s 8, and thread knife, s 7, as herein set forth for the purpose specified.

REISSUES.

2,140.—Drill.—Henry H. Packer, Boston, Mass. Patented June 29, 1858:

I claim, First, The combination in a ratchet drill of the following instrumentalities, viz: the drill stock, feed nut, feed screw, shell, ratchet wheel, and pawl carrier, substantially as set forth.

Second, The combination in a ratchet drill of the following instrumentalities, viz: the drill stock, feed nut, feed screw, exterior and inner shells, ratchet wheel and pawl carrier, substantially as set forth.

2,141.—Thrashing Machine.—Nelson Palmer, Hudson, N. Y., assignee of Isaac S. Spencer, Guilford, Conn. Patented Sept. 23, 1856:

I claim, First, The endless feeding belt or apron, B, in combination with the thrashing cylinder, F, as and for the purpose specified.

Second, Two or more thrashing cylinders with the straight, spiral, oblique, or angular corrugations, working in concert, as specified.

2,142.—Making Extracts.—Abraham Steers, Medina, N. Y. Patented March 11, 1856:

I claim, First, The within-described process of separating the soluble and insoluble parts contained in the bark or other substance to be extracted, by first saturating or swelling said substance with the menestruum, and exposing the same in its damp state to the action of steam, substantially in the manner set forth.

Second, Washing the bark or other substance after the same has been acted upon by the steam, with liquid obtained by the condensation of steam, substantially in the manner herein described.

Third, The apparatus composed of a percolator, K, and receiver, M, separated from each other by a perforated diaphragm, or its equivalent, in combination with a metallic cover, supplied with an outwardly-opening valve and with a pipe connecting the top of the percolator with the receiver, substantially as described, so that the contents of said percolator can be operated upon, first by steam generated in the receiver, and then by the percolation of the menstruum.

2,143.—Machine for Cutting Nails.—Wm. Wickersham, Boston, Mass. Patented June 26, 1860:

First, I claim the arranging the pairs of cutters substantially as described, so that the next pair but one from every pair shall be the reverse thereof, to form the opposite side of the same nail, substantially as described.

Second, The placing of each alternate pair of cutters in advance of the others, in the plane of the sheet of metal, or further from the axis of the movable cutters than the others, to enable the contiguous nails in the several columns to be cut separately, substantially as described.

Third, The employment of a continuous collective breadth of either movable or stationary cutters, sufficient to extend entirely across the sheet, added to the extent of lateral motion given to the sheet to transfer it from one set of dies to another, substantially as described.

Fourth, Forming each series of cutters in separate sections, placed side by side and otherwise arranged, substantially as set forth.

Fifth, In combination with the series of cutters arranged and operating as described, the mechanism for holding the sheet of metal while being cut, and for moving it laterally the distance from one pair of cutters to the pair that co-operates with it, and for feeding the sheet forward a distance equal to the breadth of the nail, substantially as described.

DESIGNS.

2,239.—Quarter of a Balmoral Shoe.—Thomas R. Evans, Philadelphia, Pa.

2,240.—Plates of a Stove.—Sidney Smith, Greenfield, Mass.

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Notes and Queries

R. H., of Va.—Smoke is formed of minute particles of carbon, which, being solid, reflect light, and are visible; but if the smoke is burned, in other words, if the carbon combines with oxygen to form carbonic acid, the compound takes the gaseous form, and is no longer visible. Kerosene oil is a compound of carbon and hydrogen, and when it is burned without a chimney, a portion of the carbon is scattered and cooled below the combustion temperature, escaping in the form of smoke; but if the oil in the form of vapor is confined by a chimney in contact with the oxygen of the atmosphere, till the two are heated to the temperature at which they combine, the carbon is all consumed, and no smoke is formed.

M. H. S., of N. J.—The French meter contains 39·36950635 American inches.

O. S. C.—There are several patents on self-feeding nail machines, making various sizes.

F. M. H. asks:—"Is the sale of a patent right by the patentee an income liable to tax?" ANS.—Receipts from the sale of patents are to be included, like all other receipts, in income returns, and are subject to tax.

J. C. G.—It is a very old idea to propel boats by means of belts upon which the paddles are arranged. Such a plan would work tolerably well in smooth water.

S. H. G. asks:—"Is our common cut nail a patent article?" ANS.—No. "Can a patent be obtained on a nail for a specific purpose?" ANS.—A patent can be obtained for any new and useful improvement in nails.

C. L. M., of N. Y.—India-rubber belting will answer your purpose.

D. & Co., of Ill.—A solution of potash, used hot, will remove the gum which adheres to screws while being cut.

E. D. K., of Wis., and others.—Some of our friends occasionally request us to give them the average performance and value of engines and boilers under different conditions of speed and pressure, and wholly different areas of piston. We are sorry to pass over any of these requests, but it is simply impossible, for want of time, to comply with them.

C. J. S., of Va. says:—"I saw in your last issue a question asked, if it was not practicable to manufacture pens of aluminum? They are made by a man in England, in the city of London, by the name of M. Jacobs. I have used them, and like them very much."

J. C. S., of N. Y.—Water finish on iron or steel is made by allowing water to trickle on the work at the last cut. Soapy water is better than clean. The luster thus given is unsurpassed, if the tool is sharp.

A. B., of Wis.—If your saw loses velocity by the belt slipping, put on a wider belt.

G. W. A.—There is no existing patent on the idea of heating the air in caloric engines by passing it through the furnace.

S. W. P.—Engravings and descriptions of several caloric engines have been published in the SCIENTIFIC AMERICAN.

G. B., of Ohio.—We are much obliged for your letter on negative slip, but the subject has received all the attention it merits.

B. W., of N. Y.—We are much obliged for your kind letters. You are one of our oldest subscribers and contributors; therefore we prize your warm commendations of the value of our journal. The objection to which you refer, in regard to space devoted to advertising, will, we think, be less prominent this year.

H. L., of N. Y.—Messrs. Winslow, Griswold & Holley, of Troy, N. Y., are making Bessemer steel; we know of no other firm in this country who have yet commenced the manufacture.

P. O., of Md.—Were it not for the resistance of the atmosphere, a projectile thrown vertically upward would descend with a velocity equal to that of its ascent, and its power of penetration would be the same in falling as in rising; but the resistance of the air causes its velocity to be less in its descent than in its ascent.

F. B. G., of Vt.—In producing heat by water power, the heat developed is in proportion to the friction, and would consequently be diminished by lubricating. We have very little faith in the scheme.

J. F.—The public use of a thing for over two years is a bar to the grant of a patent. An invention may be kept secret for any number of years and then patented, if no prior patent has been issued. We think you are mistaken as to what was said in the books you mention.

E. B. T., of Pa.—We do not know that the Navy Department ever issued an order against the use of tallow in cylinders; tell is not fit for the purpose—that might have been prohibited.

J. W. B., of N. H.—A sufficient reason why potash should not be found in pit coal is that it is soluble in water, and is consequently washed from out the vegetable mass during the long ages occupied in the process of converting mass into coal.

W. M., of Ind.—If you find an honorable man for a partner, you will be safe in revealing the secret of your invention.

D. D., of N. Y.—We have stated that in certain circumstances there is economy in throwing a small jet of steam into a furnace. With anthracite coal the flame is lengthened, and thus the heat may be generated more nearly where it is wanted.

A. M. S., of N. Y.—If a ball of steel, gold, or other substance be cooled, its bulk is diminished; as this change in size can occur only by the particles coming closer together, the experiment is regarded by philosophers as conclusive proof that, even in the most solid substances, the ultimate atoms do not touch each other.

J. S. G., of Mich.—In being cooled a given number of degrees, a pound of water will give out more heat, and will therefore warm a room more than any other substance except hydrogen; but it could not warm a room above its own temperature. Fruit is not injured by being frozen, provided it is cooled slowly enough.

T. S., of N. Y.—Zinc cannot be entirely separated from solder by any process that would not be more costly than the solder. As zinc is evaporated by a white heat, you can drive out most of it by heating your solder very hot.

H. W. B., of Mass.—You will find directions for making paper in "Ure's Dictionary of Arts and Sciences."

W. P. P., of Ga.—The attraction of the magnet is not cut off nor diminished by any known substance.

J. B., of Conn.—Benzole is a definite chemical compound of carbon and hydrogen, in the proportion of C12 H6. Benzine is a term now applied in our markets to the most volatile portions of petroleum; these are mechanical mixtures of several hydro-carbons, and vary with the wells from which the petroleum is derived.

F. S., of Ill.—If water were confined in an air-tight vessel, and repeatedly heated and frozen, it might not be changed, unless the vessel were of iron or some other substance that would decompose the water. But many organic liquids are decomposed by heat alone, without the chemical action of any other substance. Indeed, water will be decomposed by heat alone if the heat be sufficiently intense.

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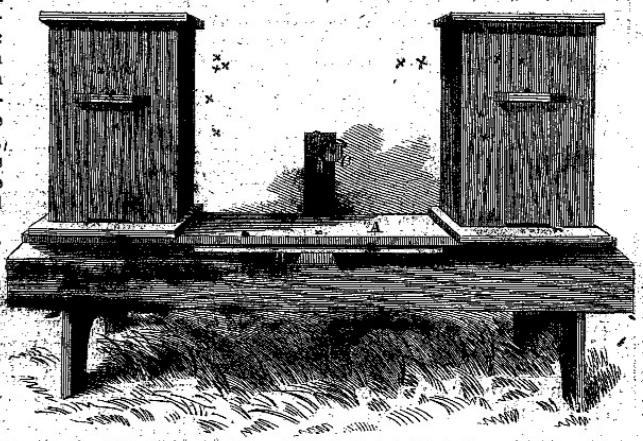

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A patent was issued through the Scientific American Patent Agency on Oct. 24, 1865, by W. W. Snell, of Rushford, Maine; for further information address him at the above place.

Improved Spring Bed.

Calm Nature's sweet restorer—balmy sleep—is not very sweet if the couch be hard and uncomfortable. That they are oftener so than the reverse many will bear witness.

A great advantage in spring beds is, that they do not require to be made up so artistically as others, That is to say, they are easy and comfortable under most any circumstances, and durable if well constructed.

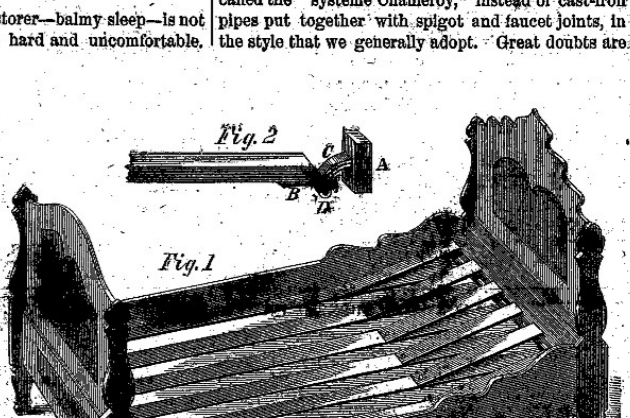
The bed here illustrated is said to be one of the very best. It is very simple in construction, has no wire springs to get out of order, and can easily be taken apart to clean and air at intervals, as all beds should be; it is moreover strong and not liable to let down the unwary slumberer at unseasonable hours of the night.

The manner of fastening the slats to their elastic support is shown in Fig. 2. Fig. 1 shows the arrangement with spring bolster attached to a bedstead. The details are as follows:—

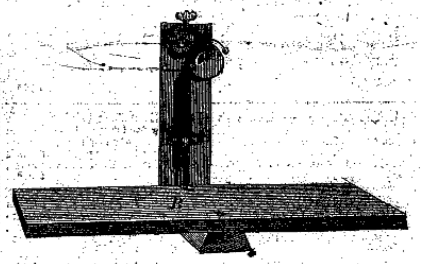
A is a piece attached to the head and foot rails, having mortises in it. Through these mortises passes elastic webbing, C, in a loop form, held to its place by means of a wire through the loops. There is a casting, B, on the under side of the slat, with an elongated eye. Through this eye the other end of the webbing loop passes, after which it is again fastened by a wire pin, D, through the loop. If it is necessary to take the bed down, all that is necessary is to slip out the wire from under the elongated eye, which entirely detaches the slats, and leaves the webbing attached to the foot, and head rest.

For simplicity, cheapness, durability, and, above all, desirability, the inventor believes it is unequalled as a spring bed bottom.

A company has been formed to manufacture this spring bed, under the style and title of the "Auburn Elastic Spring Bed Co.," for the purpose of putting it in market or selling rights.



CRONK'S SPRING BED.



SNELL'S SWARM ALARM.

This invention was patented by M. C. Cronk. For further information address Edward B. Lansing, Secretary of the Company, Auburn, N. Y.

Wrought-Iron Gas Mains.

The London *Enquirer* says:—

"The French engineers, have adopted another system of leading mains to that which prevails in England, which consists in the use of wrought-iron pipes surrounded by a coat of bitumen, or what is called the "systeme Chameroy," instead of cast-iron pipes put together with spigot and faucet joints, in the style that we generally adopt. Great doubts are expressed by the English engineers as to the durability of this kind of pipe; but the experience of the Paris engineers, which has now extended over the period of twenty-four years, may be considered to be decisive on this point; nor can there be any cause at work with the passage of gas along the pipes that can be considered otherwise than favorable to their durability. At any rate, the results of observations made upon one thousand meters of cast-iron and of wrought-iron pipes, in the course of the year 1861, gave the following results, that seem to place the question beyond doubt. The pipes yielded a loss of, as follows:—

	Cast-iron.	Wrought-iron.
In consequence of accidental breakage	1·60	0·469
In consequence of use by time or depreciation.	0·833	0·196
Inconsequence of shaking or joint	1·77	0·520

"Guided by these results, which have only confirmed the long practice of their engineers, the Paris Gas Company has proceeded to lay down as much as 72 per cent of their main pipes in this style, against 27 per cent of cast iron pipes, and 1 per cent of lead pipes. It is true that in Paris the service pipes are all of lead, when in England wrought iron is generally used, and this must be considered to have a considerable increase upon the loss by leakage; but in Paris the total loss that was ascertained to have occurred in this manner, in the course of the year 1863, was a shade more than 10 per cent; whereas the average loss of the London gas companies has been estimated at 25 per cent of the total of the gas made—it was 10,083,678 meters cube upon 100,833,258 meters cube, ascertained at the consumers' meters. It is questionable whether the greater care with which the operations of the Paris Gas Company are conducted may not account for much of the difference that is thus recorded; but this appears certain, that the loss through the wrought-iron mains is less than with cast-iron ones; and the expense of transporting them would be considerably less than would be incurred in the case of the latter.

THE SCIENTIFIC AMERICAN

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